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Policy for Shell Moulding

It is obvious that the process of shell moulding has grown to a prodigious extent and its impact is felt on every foundry activity between the making of a pattern and finishing in the machine-shop. As a result, there will be in the not-too-distant future keener requests for dimensional accuracy imposed upon our industry by the engineering buyer. The question of the establishment of a new association to look after the interests of the process and its products has been under discussion, but we are firm in our opinion that the best method of ensuring orderly development is to enlist the help of the existing organizations, for by so doing every facet will thereby be covered. Primarily, for pure research, there are those organizations in the industry which are magnificently equipped to carry out such work. Next, there are the employers' associations, most of which have facilities—either through their close association with the research bodies or by their own technical committees—to carry out co-operative investigations on the subject. The firms manufacturing equipment or supplying the raw materials for the process also have available a live body well capable of looking after their interests. Important, too, is the newly-formed master patternmakers' society. Finally, for correlating all the technical activities and disseminating information by means of committee reports, there is the Institute of British Foundrymen.

The fact that this method of investigation would involve the co-operation—not too easily attained—of nine or ten bodies is not of oustanding importance, provided that the receiving end—that is, a sub-committee of the Institute—be formed, as that body could deal with the sorting out, arranging, vetting and publishing of accredited technical opinion and data. Conforming with tradition, the Institute already has been an important medium for disseminating knowledge on the subject. The British Cast Iron Research Association has already undertaken some work on shell moulding, whilst at the moment the British Non-Ferrous Metals Research Association, in co-operation with the Association of Bronze and Brass Founders is appointing a scientific officer to investigate the subject. No doubt, shell moulding is also on the agenda of the other associations within the industry.

It is clear that, so far as development is concerned, the industry possesses all the necessary machinery for its proper and orderly prosecution and it merely needs an initial impetus to set it in motion. As for the commercial aspects, the negotiation of appropriate wages can be effected through the existing channels, with the advice of the interested parties. Regarding Patents, it should be realized that many of the applications being made are not of a restrictive character, but ensure that the inventor or "developer" can apply the benefits of his own work. It is on record where an invention, not patented by the discoverer, has been so protected by a second person—in one case, a foreigner—and as a result, the real inventor and his compatriots have had to pay royalties. It is fair comment that, so far as the fundamental principles of shell moulding are concerned, progress has been so rapid that there is little evidence of restriction of development. Moreover, there are a dozen or more firms making machinery for the process,

Policy for Shell Moulding

along with a large number of concerns supplying the various raw materials, giving to the foundry industry choice from a wide range of products. Whatever the outcome, the action taken for the formation of a new association to cover shell-moulding has been really worthwhile, because it focused attention on the need for co-operative action to aid with the proper development of the process.

I.B.F. National Works Visits Day

Tees-side Branch to be Hosts

In view of the outstanding success of the four previous annual national works visits days, the Council of the Institute of British Foundrymen has decided to repeat the function once more, and has accepted the offer of the Tees-side branch to make the arrangements. These works visits supplement the arrangements which are already made by branches and those afforded at the annual conferences, and in particular enable those members who cannot spare the time to attend the whole of the annual conference to take part in an annual national gathering. It is hoped that other branches will assume responsibility for arrangements in future years. In the present instance the Council are indebted to Tees-side branch members and especially to its hon. secretary, Mr. Frank Shepherd, for undertaking this work. Especially, thanks are due to the directors and staff of the works concerned, who have agreed to accept the parties and show their foundries.

Detailed Arrangements

The arrangements made by the Tees-side branch are as follow:—

The visits will take place on Friday, October 8, 1954 to a number of important firms in the Tees-side area. These have been divided into groups of two; each group of visits will consist of one in the morning and one in the afternoon. Luncheon will be provided at some suitable place about mid-day. Members are asked to indicate on a reply-form which group of visits they wish to attend, and, as numbers permitted to attend each group are limited, second and third choice should be made. In the evening at 7.30 p.m. on the same day there will be a dinner at the Teesdale Hall, Thornaby, and entertainment.

The starting points and times at which the coaches will leave for the various visits are as follow:—Visits "A" and "B": Market Place, Darlington (9.30 a.m.); visits "C," "D" and "E": Town Hall, High Street, Stockton-on-Tees (9.30 a.m.) and visit "F": from hotels (9.30 a.m.). It should be specially noted that those taking part in visits "A" and "B" should reserve hotel accommodation in Darlington. Participants in visits "C," "D" and "E" should reserve hotel accommodation in Stockton, while those attending visit "F" should reserve hotel accommodation in Middlesbrough. In all cases hotel bookings should be made *only* after confirmation by the Institute as to the visit to which members have been allocated. Special transport will be available without charge on Friday evening to pick up, from the same points as in the morning, members wishing to be conveyed to the Teesdale Hall and also for the return journey after the dinner is over. The charge for each group of works visits including transport by coach, luncheon, gratuities and administrative expenses is 20s. The additional charge for the dinner in the evening at the Teesdale Hall is 17s. 6d.

Members who desire to participate are requested to return the reply-form to the hon. secretary, Tees-side branch, Institute of British Foundrymen, c/o. Head, Wrightson and Company, Limited, Thornaby-on-Tees.

Party.	Morning visit.	Luncheon.	Afternoon visit.
A.	Darlington Forge, Ltd.; (heavy steel foundry and forgings up to 75 tons; open-hearth melting).	Robert Stephenson & Hawthorns, Ltd.	Robert Stephenson & Hawthorns, Ltd.; (builders of main-line steam locomotives; small non-ferrous foundry).
B.	Thos. Summerson & Sons, Ltd.; (jobbing and mechanized foundry, Tropenas melting plant).	Thos. Summerson & Sons, Ltd.	Darlington Forge, Ltd.
C.	Head, Wrightson & Co., Ltd.; (steel and alloy foundry—laboratory—jobbing and machine moulding—electric-arc and induction melting).	Teesdale Hall—Head, Wrightson & Co., Ltd.	R. W. Crosthwaite & Co., Ltd.; (light castings and vitreous enamelling for domestic stove-grate supplies).
D.	R. W. Crosthwaite & Co., Ltd.	Teesdale Hall—R. W. Crosthwaite & Co., Ltd.	Ashmore, Benson, Pease & Co.; (jobbing and semi-mechanized Meehanite foundry; structural shops)
E.	Ashmore, Benson, Pease & Co., Ltd.	Teesdale Hall—Ashmore, Benson, Pease & Co.	Head, Wrightson & Co., Ltd.
F.	Cochranes (Middlesbrough) Foundry, Ltd.; (spun-iron pipe plant and sand foundries).	Cochranes (Middlesbrough) Foundries, Ltd.	Dorman Long & Co., Ltd.; (basic open-hearth steel works—five 300-ton tilting furnaces and two 600-ton mixers).

Conference Paper Author

MR J. E. O. LITTLE, Author of the Paper "Simple Foundry Expedients which have Proved Worthwhile in Recent Years," (see page 99) was educated at Rutherford Technical College, Newcastle. He received his early metallurgical training at the North Eastern Marine Engineering Company, Limited, and R. & W. Hawthorn, Leslie & Company, Limited. He then took up a position with the Caledon Shipbuilding & Engineering Company, and continued there for five years until 1930 when the foundry was closed. In 1930, he held the appointment of foundry metallurgist to the London & North Eastern Railway, and from there took up an appointment as metallurgist with Glenfield & Kennedy, Limited, Kilmarnock. He was promoted to foundries manager in 1939 and still holds that appointment. A member of several technical groupings including the Meehanite Research Institute, and the British Cast Iron Research Association, he is chairman of T.S.37 of the Institute of British Foundrymen, which body he joined in 1932.

Dust Problems in Iron Foundries*

By E. Morgan, M.Sc., and P. J. Moseley, A.R.I.C.

The Authors endeavour to show that there is not only a close connection between silicosis and the chemical composition of the dust, but also with its size and concentration. After a preliminary survey, the paper is divided into three main parts as follow. (1) *Medical and chemical aspects of air-borne dusts;* (2) *dust measurements* (*concentration, size and chemical nature*); *and* (3) *dust-control methods and their efficacy. The Authors do not profess to be experts, but thought that an interim report on their findings should be recorded.*

Introduction

In recent years, increasing interest has been taken in the subject of the hazards to health likely to arise from the presence of air-borne dusts in iron foundries. This interest will now, inevitably, have to be intensified in view of the new Regulations which come into force in 1956. Iron foundries are faced with the possibility of having to spend large sums of money on improving conditions in the shops if they are to comply—as they must—with the Regulations. The questions confronting all iron foundries are:—(1) What are the dust conditions; (2) are they inimical to the health of the worker; and (3) if the conditions are dangerous, what steps can be taken to allay the risks?

Before one can attempt to answer these questions, one must know what the dusts are, their chemical composition, size and concentration. It must be known to what extent these dusts are toxic, how they arise, and how to remove them from the air or preferably, how to prevent them from arising. This is a bare statement of the problem, and it is obvious that for its solution founders must have the services of workers from several different professions; the engineer, the foundryman, the metallurgist, the physician and the chemist all have their contribution to make.

The Stanton Ironworks Company, recognizing the importance of the problem, decided some time ago to embark on an intensive study of the conditions in their own works. These investigations have been proceeding for some time and gradually information is being accumulated which can be made use of. In common with any other type of investigation, one had to start by trying to find, from the published literature on the subject, what was already known. It was discovered that very little of the available information referred specifically to iron foundries and the Authors had to seek data from the work which had been done in other industries. Here something was learned of the relationship between certain dust conditions and lung diseases, particularly silicosis and pneumoconiosis, also something of the methods used by these workers in their attempts to assess the dust conditions quantitatively.

Although there is some evidence that silicosis is a rare disease among ironfoundry workers, pneumoconiosis is less rare and the inescapable fact that silica sand cannot be divorced from the foundry makes it imperative that as much as possible should be learned about these two industrial diseases. Furthermore, it is only by sifting all the available evidence which has arisen from the research work on these diseases that it is possible to attempt to assess the toxicity of air-borne dusts.

MEDICAL AND CHEMICAL ASPECTS OF AIRBORNE DUSTS

According to the literature on the subject, lung diseases due to dust from metal processing have been in evidence for almost 2,000 years. The earliest recorded reference was one in Pliny's "Natural History," which was written in the first century A.D. Here is mentioned the use of bladders as a crude type of mask designed to avoid inhalation of dust. Many references to silicosis and similar diseases appear in the medical literature throughout the whole of the Middle Ages, and although most of the references are to miners, some refer to foundrymen. Diemerbroeck, in 1649, was the first to carry out an autopsy on a person who had died from the disease which we now know as silicosis, and he described the examination of diseased stone cutters whose lungs contained so much sand that, in carrying out his autopsy, he thought he was cutting through some sandy body.

William Buchan, in his "Domestic Medicine" in 1872, wrote that founders amongst several other "artists" were hurt by the unwholesome air which they were obliged to breathe. Foundrymen will be interested to learn more of his statement in which he records: "It may seem romantic to recommend gardening to manufacturers in great towns, but observation proves that the plan is very practicable. In the town of Sheffield, in Yorkshire, where iron manufacture is carried on, there is hardly a journeyman cutler who does not possess a piece of ground which he cultivates as a garden. This practice has many salutary effects."

It was not until the 19th century, however, that the development of the idea that inhalation of any kind of dust would affect the lung was mooted but that some dusts were to be considered more dangerous than others and more attention should be paid to the industry in which the victims of lung diseases were to be found. It was noted that bricklayers and lime

* Paper presented to the East Midlands branch of the Institute of British Foundrymen. At the annual general meeting of the Institute in Glasgow, the Authors were awarded a diploma for this Paper.

workers lived to ripe old age but that sandstone masons and stone dressers were short lived. The dangerous character of grinding operations was also recognized and one gentleman went so far as to suggest that fork grinding ought to be confined to criminals.

Pathological Aspects

As pathological techniques improved, and various scientific instruments became available to the profession, progress in the study of pulmonary diseases increased. In this progress, the development of the modern microscope and also of X-ray techniques have been milestones. Even so, it was not until 1894 that lung fibrosis associated with chronic tuberculosis was clearly differentiated from fibrosis due to other causes, and even at the present day, it would appear that diagnosis is only certain after death, a fact that can be embarrassing as silicosis is an industrial disease for which compensation can be quite rightly claimed.

Herbert J. Weber in a paper entitled "Industrial Hygiene in the Foundry" in 1949 said that many a compensation claim has been paid when the disability was due to syphilis rather than lead or due to cancer of the lungs rather than silica. He goes on to say that when racketeering was at its worst, it was not unusual for a set-up consisting of a crook fettler, a crook doctor and a crook lawyer in certain States, to sue foundries for compensation for disability through silicosis. The main difficulty in accurate diagnosis in foundry workers at any rate, is the fact that iron-oxide dust which is always present in foundry atmosphere gives rise to a condition known as siderosis and although this condition is a non-disabling one, it can produce X-ray plates very similar to those caused by silicosis.

During the twentieth century, a vast amount of research has been devoted to the occurrence of lung disease due to the inhalation of dusts and it has been established that the most dangerous of industrial dusts is free or uncombined silica and that this dust is capable of setting up a nodular fibrosis which is called silicosis.

Respiratory System

Before attempting to explain the precise effect of silica dusts on the lungs, it is necessary to consider the structure of the human respiratory system which in itself may be looked upon as a dust extraction unit. (Fig. 1). The very coarse dust particles are retained in the nose and the air containing the smaller sizes of dust passes down into the trachea which is a tube about 12.0 cm. long and 1.4 to 2.0 cm. dia. This leads to the two main bronchi, one for each lung. Each of the main bronchi splits into six primary bronchi and the latter are about 3.0 cm. long and 0.4 cm.i.d. Off the primary bronchi lead the secondary and then the tertiary bronchi and at every stage the number of tubes increases and their size decreases until the tertiary bronchi lead into the bronchioles of which there are some 54,000. All these tubes have one thing in common and that is they are provided with a continuous lining of tissue cells which possesses the property of being able to trap larger dust particles and by the movement of the cells help to expel them to the larger tubes. Removal from these larger tubes is by coughing, sneezing, etc. The remainder of the respiratory system consists of the respiratory bronchioles, the alveolar ducts and the alveolar sacs and these increase in number and decrease in size continuously until there are 52 million alveolar sacs; (see Table I).

FIG. 1.—*Scale diagram of respiratory channels of the human lung.*

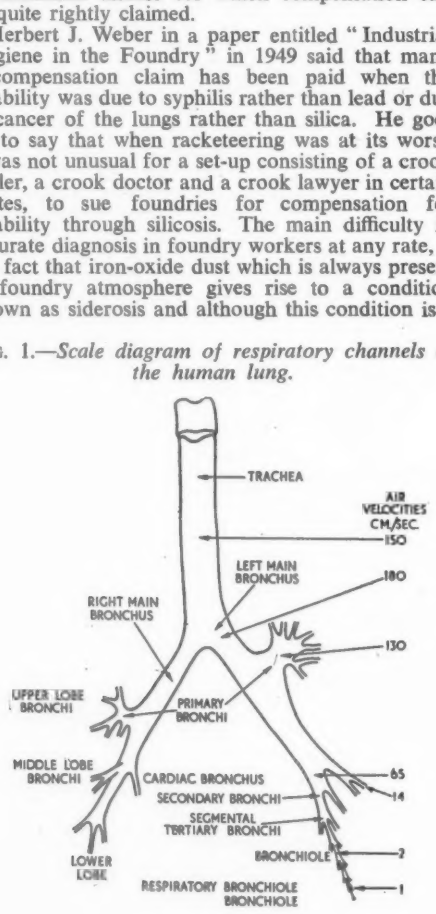


TABLE I.—*Dimensions of Human Lung.*

Part of lung.	Number.	Length.	Internal dia.	Volume.
		cm.	cm.	$cm.^3$
Trachea	1	12	14-20	14.3
Main bronchi ..	2	25-5	10-16	7.1
Primary bronchi ..	12	3	0.4	4.5
Secondary bronchi ..	100	1.5	0.2	4.6
Tertiary bronchi ..	770	0.5	0.15	7.0
Bronchioles .. .	54,000	0.3	0.1-0.2	4.5
Respiratory bronchioles	110,000	0.15	0.05-0.1	33
Alveolar ducts	..26,000,000	0.02	0.02	164
Alveolar sacs	..52,000,000	0.03	0.03	4,320

The only means of removing dust particles from the lower lung cavities are the phagocytes which can transport the particles to the bronchi, where the tissue cells can lift them up to the large tubes. Unfortunately, however, only a limited number of phagocytes are available in the lung and not all particles can be rendered harmless if a large quantity of dust is breathed in. Individual susceptibility towards silicosis varies considerably and the reason for this probably lies in the differences in the efficiency of this human dust-extraction system. Figures varying between 5 and 80 per cent. have been quoted for the amount of dust retained in the body.

Dangerous Sizes

Measurements of the size of dust particles from the lungs of silicosis victims have shown that particles larger than 10 microns dia. do not penetrate to the alveoli and therefore that particles below this size are responsible for the onset of the disease. One micron is one thousandth part of a millimetre and some idea of this size may be gained from the fact that the diameter of a human hair is approximately 80 microns and the limit of resolution of the optical microscope is one-fifth of a micron. (See Fig. 2).

Most authorities agree that the important range of particle size is below 5 microns (*i.e.*, 1/200 mm.) and that it is probably concentrated around the one-micron size. Autopsies carried out on victims have given weights of silica embedded in the lung tissue of the order of 100 gm. (over three ounces), and if this weight be made up of particles of one micron then over one hundred million million particles would be present.

The effect of silica dust is to set up a mechanism whereby a fibrous lung-growth takes place. This growth and the silica particles in it block and stiffen the alveoli so that breathing becomes more difficult and vital lung space becomes lost. Once this has taken place there is no cure and because of this, all workers on silica-dust problems have a special responsibility, as the effects of any mistake may be permanent as far as personnel are concerned.

Mention has been made of the fact that the most dangerous dust consists of free or uncombined silica and some doubt exists on the exact way in which this substance causes the disease. One theory is that the fibrosis is produced by irritation of the lung tissue by the sharp-angled particles. It points out that freshly broken silica particles would be very sharp and this would explain the high incidence of the disease in blasting and grinding operations. Another theory is that the silica is dissolved in the lung and it is the silicic acid which sets up the fibrosis. Weight is given to this theory by modern research work which has shown that blasting and grinding operations can produce silica particles with a surface which is highly chemically reactive. In thinking in terms of chemical action, one is apt to consider silica to be inert, but the mass of a one-micron dust particle is so small in relation to its surface area that it becomes far from unreactive. To illustrate this, the solubility of quartz dust of different grain sizes has been determined as shown in Table II.

TABLE II.—*Solubility of Quartz Dust in* 0.1-N. *Hydrochloric Acid* (3 *hr s at* 37 *to* 40 *deg. C.*).

Particle size, μ	Solubility, per cent.	Particle size, μ	Solubility, per cent.
100 to 50	0.000	10 to 5	0.20
50 to 20	0.003	5 to 2	2.77
20 to 10	0.004	< 2	20.02

Mitigatory Factors

Not all dusts, of course, consist entirely of free silica, and the materials which are mixed with the siliceous portion of the dust can have a great bearing on the effect of the dust on lung tissue. Alkalis such as soda ash are reported to increase the danger, and iron and aluminium are sometimes considered to have a beneficial effect. In fact, in the pottery industry, a certain amount of success in combating the incidence of silicosis has been achieved by injecting into the atmosphere of the workshops very fine particles of metallic aluminium. At the same time, it is an accepted fact that inhalation of pure aluminium dust can produce lung injuries and it is felt that where the aluminium is used against silicosis the dangers in its use may be as great as the dangers it is supposed to be combating.

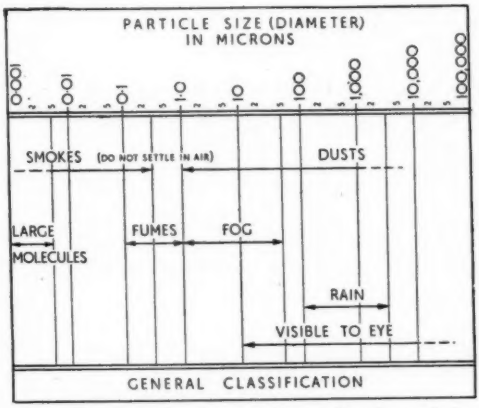


FIG. 2.—*Particle size of dust related to their general classification.*

The use of other protective dusts has been considered, particularly on the Continent. Lime-containing dusts are considered to have no adverse effects and it is even claimed that sufferers from silicosis have been cured when transferred to a lime works. There is also some statistical evidence to show that lime prevents the onset of the disease. At two quarries for example, a comparison was made of the silicosis incidence rate of the workers. At the first, the rate was over 20 per cent. and at the second, only 3 per cent. and men of this group were probably employed at the first quarry at an earlier stage in their working life. A comparison of the methods of working in the two quarries showed no significant differences, but chemical analysis showed that the stone from the first quarry contained very little calcium oxide while that in the second contained quite a high proportion. It is probably an over simplification, but it has been said that where there is little lime in the dust, silicosis is common and where appreciable quantities of lime are to be found then silicosis is rare. Where no lime occurs naturally in the dust, experiments have been carried out on the Continent with the injection of lime dust into the atmosphere and over a period of seven years it is claimed that people who gave no indication of the disease at the onset of the trial were still free from it at the end. People with a slight silicotic condition showed some improvement and the silicosis was arrested after a period of a year or so but workers with medium or heavy silicosis gained no benefit, thereby adding

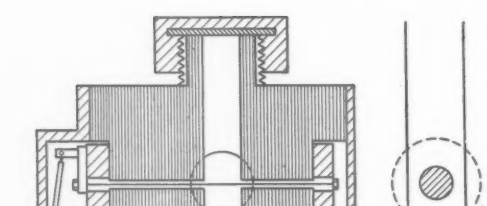


FIG. 3.—*Diagrammatic representation of the "head" part of the thermal precipitator type of dust-estimation apparatus.*

weight to the view that a reversal of the silicotic condition is impossible.

Another way at least in theory, in which the effect of silica dust may be minimized is by causing it to combine with other dust particles to give an agglomeration of larger particle size and therefore of a higher settling rate and less capable of penetrating to the lower lung cavities. The theory is that the silica dusts which are particularly dangerous become electrically charged at the moment of their formation and the charge that they carry is usually a negative one, so that by injecting into the atmosphere, particles which contain a positive charge, *e.g.*, calcite, the danger may be minimized. As far as is known, however, there is no recorded instance of this theory being successfully put into practice.

All this information is of course mainly concerned with silicosis, which is a particularly virulent form of lung disease. Pneumoconiosis is a somewhat similar condition which is caused by a non-silica dust and while this disease takes a much longer time to become disabling, its effects are very similar to those of silicosis. There is some evidence that, although silicosis is comparatively rare in iron foundries, pneumoconiosis may not be.

So far, the Authors have dealt in a general way with medical and chemical aspects of the problem and at this stage have sufficient background information to enable them to assess the hazard in any particular foundry unit even if this assessment is a very rough one.

DUST MEASUREMENTS

The first step is to find out just how much dust is in the air that is being breathed by the operatives and for this purpose there are several instruments available; in fact there are several methods. One method estimates the atmospheric pollution by the amount of staining on a light-coloured filter medium. Another is concerned with the measurement of the mass of dust particles removed from the air by filtration and the third (and the Authors consider this the best method) is by counting or estimating the number of dust particles in the atmosphere. Without going into any great detail, it will be obvious that any method dealing with the mass effect is liable to give an erroneous picture of the hazard. For example, a few particles of comparatively large diameter would give a fairly high mass-concentration figure and the impression that conditions were bad might be gained. On the other hand, a large number of very small particles might give a very low weight per unit volume of the atmosphere, but at the same time represent dangerous conditions. Nevertheless, there may be some application of both the staining and the weighing methods in plants where any dust-producing process is continuous and where previous experience has shown that a fairly constant amount and size of dust is present throughout the working day.

Thermal Precipitator

Of the several instruments which are available for the estimation of the amount of dust in the atmosphere, the Authors, at Stanton Ironworks, have two. The first of these is the standard instrument known as the thermal precipitator and is probably the most accurate one available. The principle of the instrument is that there is always a dust-free space around a hot body and the thermal precipitator has as its hot body an electrically-heated wire placed between two parallel cover-glasses. The glass slips are placed in such a position that the space between the wire and the cover slips is completely within the dust free zone so that when dusty air is drawn through this zone the dust from the air is deposited on the glass slips. The general design of the unit is shown in Fig. 3 and 4. It consists of three main parts:

(1) The precipitator head which contains the heating wire and also rotatable plugs which serve as slip carriers.

(2) A control box which contains a rheostat, an accumulator and an ammeter, which ensures that the current through the wire is kept at a known level.

(3) An aspirator which draws the air sample through the head.

The amount of water run out of the aspirator determines the volume of air drawn through the head. Where it is inconvenient to mount the head on top of the aspirator as shown in Fig. 4 a length of rubber tubing may be used between the two. In this instrument the dust is deposited in two traces, one on each slip. As a precaution against unequal deposition, the traces on both slips have to be counted. After sampling, the slips are removed from the head and, following preliminary drying to avoid interference later due to water, are mounted on a glass microscope slide with the dust traces sandwiched between the two glass surfaces. The slide is then transferred to the microscope stage and the dust trace is located using dark-ground illumination. The trace selected is then examined at a magnification of $\times 1{,}000$ and a count is performed. This is carried out using a Patterson and Cawood graticule inserted in the eyepiece. The graticule consists of a rectangle of known dimensions (4.4 mm. by 2.0 mm.) which is used as a frame for counting. Also marked are rings of known size that enable the size of the dust particles to be estimated.

The counting is carried out in the following way:—

The short side of the rectangle is made to coincide with the long edge of the trace and the particles falling within the frame are counted. The slide is then moved and the count repeated until the whole of the particles across the section of the trace under examination have been counted. This procedure is repeated at at least one other point on the trace in order to compensate for possible irregular formation of the deposit.

Owen's Jet Counter

The second instrument in use at Stanton is the Owen's jet counter shown in Figs. 5 and 6. The apparatus is shown diagrammatically in Fig. 6 and consists of: (1) a damping chamber; (2) the head in which is enclosed a cover-slip clipped to a rotatable disc which enables the deposition of up to three traces on any one slip. (If more than three deposits are collected on one slip, difficulty is experienced in the counting stage), and (3) a hand pump, which is used for drawing air into the head and which has a delivery rate of 50 ml. per complete stroke.

In this instrument, dust-laden air is drawn through a damping chamber which saturates the air with water-vapour. On passing through the jet, which is in the form of an oblong slit, a reduction of pressure takes place and some of the water-vapour condenses on the dust particles. The stream of air then impinges on the cover-slip and a change in direction takes place. The moist dust particles deposit on the slip and due to the pressure and temperature rise at this point the water evaporates leaving the dust trace on the slip.

The actual sampling is carried out as follows:—Dusty air is flushed into the apparatus (ten strokes on the pump are used as standard practice), and the valve is opened, allowing the air to enter the head. Immediately a complete stroke is made, 50 ml. of dusty moist air enters the head and the dust deposits on the glass slip. If the air is known to be comparatively clean, a 100-ml. sample may be taken. The slip is then removed from the head and mounted on a microscope slide and the counting operation is carried out in the same manner as described for thermal precipitator samples.

Konimeter

Another instrument in fairly general use is the Konimeter (Fig. 7), which is very simple and compact. It consists of a pump which draws in air so that it impinges on a glass cover-slip which is prepared with a sticky substance. This produces a dust spot on the slide, so positioned that the spot is near the edge of the slip and its size is such that about 30 dust specimens may be taken on one slide. This instrument has been used extensively in the South African gold mines and in British coal mines.

Comparisons

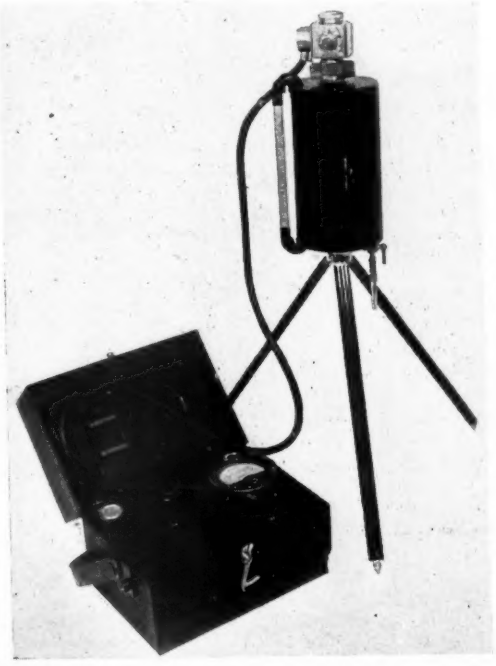
There are, of course, other instruments available but the three mentioned are in fairly general use. All three have big advantages and disadvantages. The thermal precipitator is very accurate but it is very cumbersome and as it samples over a period of minutes it gives only an average picture of the conditions. The opinion of some authorities is that average results can be very misleading because a sudden high concentration of dust may flood the natural lung defences and be very dangerous to health. In other words, any instrument which gives an average picture over a period may not be giving the necessary warning of health hazards.

On the other hand, the instruments available for instantaneous sampling although usually light and compact, are comparatively inaccurate and usually selective in the range of particle sizes that they will sample accurately. In the case of Owen's instrument, it so happens that it does not sample accurately particles appreciably greater than one micron in diameter. Since the one-micron range is the most important, it follows that this is not a big disadvantage from the foundry point of view.

The Konimeter is comparatively inaccurate and is particularly liable to give widely varying results with different operators. However, recent work on the standardization of the method of its use has produced a considerable improvement and although it will sample only a comparatively small proportion of dust, this proportion is reasonably constant and the measurements do fairly closely follow changing dust concentration.

Whichever instrument be used for sampling the dust, the counting technique is of necessity long and tedious. The particle sizes in which founders are interested are such that they are only visible

FIG. 4.—*Thermal precipitator equipment, consisting of three parts: head, control box, and aspirator.*



under magnifications of at least × 1,000 and unless one is fortunate enough to possess a good projection microscope then counting can be carried out only for short periods with one operator, as the eye-strain is appreciable, particularly with a monocular microscope. Fortunately, for many purposes, an estimation instead of an accurate count may be employed, and this method of approach has been put on a very sound and simple footing by Lawrie whose work on dust in foundries is well known. After examining very many dust traces from the Owen's jet counter, he found that because the dust deposition on the slip was very even both across and along the trace, it was possible to estimate the total quantity of dust sampled merely by looking at one section of it. To assist in this visual estimation, standard photomicrographs were made and a group system of reporting was adopted. These groups are:—

	particles per ml.
Group 1.	200
Group 2.	400
Group 3.	800
Group 4.	1,600
Group 5.	3,200
Group 6.	6,400

No grouping over 6,400 particles per millilitre was considered necessary, as conditions worse than this are obviously very injurious to health. This method of estimation has its obvious limitations. It is very good for carrying out a general survey of a particular foundry, but if an accurate check on a particular piece of equipment is required then the grouping is too coarse, particularly in the high range, to enable the effect of modifications to be assessed. For this latter purpose, counting must be carried out.

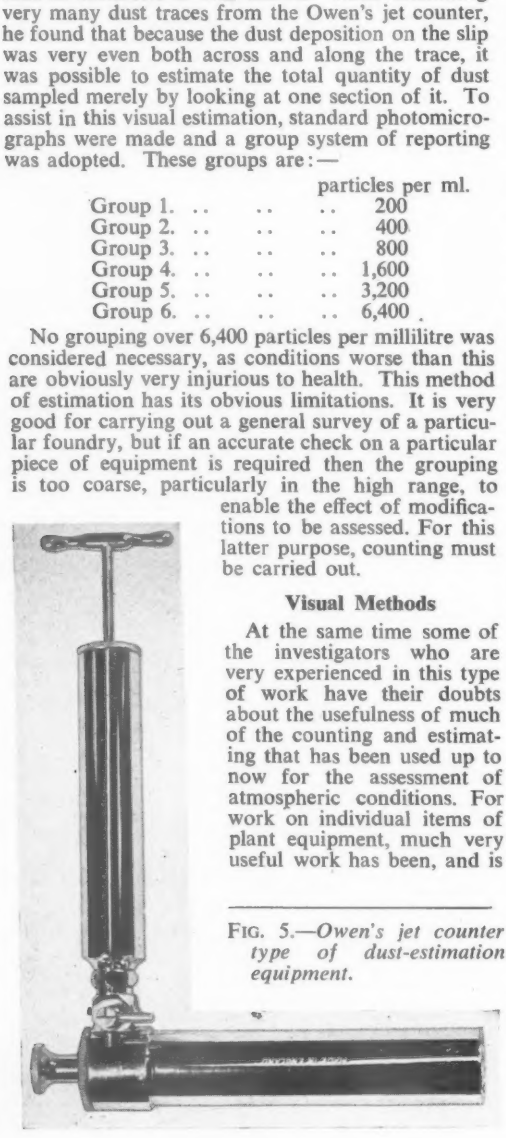


FIG. 5.—*Owen's jet counter type of dust-estimation equipment.*

Visual Methods

At the same time some of the investigators who are very experienced in this type of work have their doubts about the usefulness of much of the counting and estimating that has been used up to now for the assessment of atmospheric conditions. For work on individual items of plant equipment, much very useful work has been, and is being carried out with the use of high-intensity beams of light to enable the formation and movement of dust clouds to be followed with the naked eye. Another method of approach, particularly on exhaust systems, is the use of smoke canisters which again allow visual observations to be made. Both of these methods have obvious advantages and disadvantages. The high-intensity-light method is obviously very good if complete elimination of all dust particles is both necessary and possible but although the Authors have no practical experience with this method as yet, they would imagine that it is difficult to assess the dust concentrations, visually, especially in the lower ranges. Obviously, such an example would be a case for the use of high-intensity light-beams, supplemented by sampling with a thermal precipitator or other instrument.

The smoke-canister method has the obvious disadvantage that the particle size of smoke is appreciably smaller than that of the dusts which would normally be produced under foundry conditions. Both these methods have a big advantage in that the results that are obtained are available instantaneously and far less man-power is needed than with the counting methods, where the work of assessment is both long and laborious. This means that experimental work can be carried out more quickly and the cost of such work is considerably reduced. Another big advantage is that ciné film can be produced as a permanent record of the effects produced and of the work done, and this in a form more likely to arouse interest than the prosaic written or typed word.

The use of visual methods, however, is limited in investigational work carried out in foundries which are working whilst the investigation is in progress. The lighting equipment for the first method involves trailing leads and high-intensity light-beams must be considered as a potential danger in any shop where molten metal is being handled. The smoke-canister method, although completely mobile and taking up very little space, does add to the pollution of the atmosphere and in a restricted space could be very obnoxious.

Chemical Analysis

Estimation of the concentration does not give the whole picture, and, although it can be argued that any dust is dangerous to some extent, it is nevertheless advisable to know its chemical composition. As with the concentration methods, no single mode of determination is completely accurate and convenient, but the one most attractive to the normal foundry is chemical analysis. As the weights of the dust are very small in the respirable size-range, it is necessary to employ micro-chemical methods in order to avoid very long sampling periods. The dusts are usually sampled by drawing the dust-laden air through a dense filter medium and after the sampling period, the filter is dissolved or volatilized leaving the dust particles behind. Suggested filter media are salicylic acid and acetate rayon, both of which are readily soluble in specific organic reagents. The recovered dust must then be graded

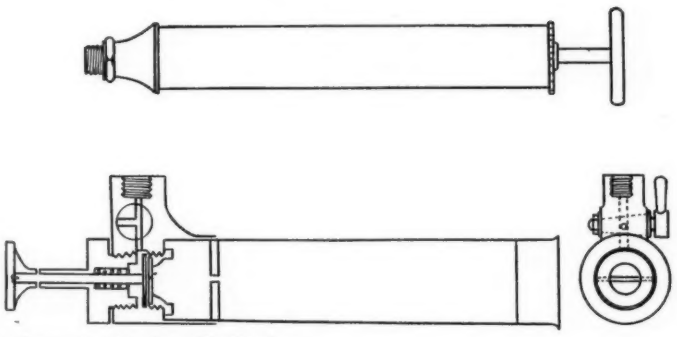


FIG. 6.—*Diagrammatic view of the Owen's jet counter instrument.*

into the various particle-size ranges and this is accomplished by the settling of liquid dispersions. The coarser particles settle naturally and the finer particles in which foundrymen are particularly interested are then separated in a high-speed centrifuge.

The sample is then ready for analysis and whilst a complete analysis of every sample would not be possible at least a free-silica determination is desirable. The equipment and specialized staff-training required for micro-chemical analysis is very expensive but its use need not be confined to work on dust problems. The present state of knowledge of the micro-chemical analysis of very small dust particles is such that the results obtained should be considered to be indicative rather than absolute and perhaps the best advice that can be given to anyone undertaking any work on dust formation and control is to cultivate a highly suspicious attitude to all the results obtained in all sections of the work.

DUST CONTROL

Having attempted to assess the conditions it now has to be considered what can be done to improve them. For the purposes of this discussion, foundries are divided into four sections—moulding, casting, knocking-out and fettling. It is fully appreciated that in some foundries some or all of these operations take place in one enclosure and the division is for the purpose of simplification only.

(1) *Moulding*

The obvious way of keeping air-borne dust to a minimum lies in preventing the formation of small dust particles or in keeping them out of the atmosphere. This would appear to be a superfluous statement but the Authors are quite convinced that there are few foundries where a careful examination of the conditions would not produce some simple means of reducing dust. As the sizes of dust particles that are being considered are normally invisible to the naked eye, their source is not always obvious, but there is no doubt that any movement of sand in the dry state will give rise to air-borne dust clouds. Conversely, wet sand does not give rise to atmospheric pollution and contrary to the general belief, the sand does not have to be highly saturated for this to be so. In fact it has been shown by Bright and Shaw of the British Cast Iron Research Association that if a moulding sand containing between one third and two thirds of its normal working moisture evenly distributed then it is almost impossible to produce significant amounts of dust in normal handling. Good-housekeeping is a much abused term, but there is little doubt but that increased attention to the tidiness and the general condition of the shop would provide significant improvement in dust conditions.

(2) *Casting*

Generally speaking, casting-shop conditions are fairly good, at least from the lung diesease point of view, but where desulphurization is carried out there is some danger that air-borne alkali may be increasing the hazard both in the casting and other adjacent shops.

(3) *Knock-out*

The knock-out is undoubtedly one of the biggest causes of dust propagation and at the same time it is one of the most difficult with which founders have to deal. The danger at knock-outs has been underlined by the new Iron and Steel Foundries' Regulations of 1953 which state:—

"All knock-out operations shall be carried out—

(*a*) in a separate room or in a separate part of the foundry suitably partitioned off, being a room or part in which, so far as reasonably practicable, effective and suitable local exhaust ventilation and a high standard of general ventilation are provided; or

(*b*) in an area of the foundry in which, so far as reasonably practicable, effective and suitable local exhaust ventilation is provided, or where compliance with this requirement is not reasonably practicable, a high standard of general ventilation is provided."

This regulation which comes into force on January 1, 1956, is one which will affect everyone and as far as can be seen at the present moment will involve most iron founders in considerable capital expenditure for partitioning and ventilation equipment. Once again something can usually be done to minimize the production of atmospheric dust, particularly at knock-out points. In one of the Stanton works, a knock-out point for small castings is fitted with a water spray in order to suppress as far as possible, the atmospheric pollution. This is a very small and comparatively cheap device but its efficiency is demonstrated by the following figures:—

Average Dust Concentration.

	particles per ml.
"Wet"-water spray	1,600
Ordinary water spray	2,400
No spray	3,200

These figures were recorded close to the knock-out and below normal breathing level. The normal practice is to use a water spray containing a detergent and a plain water spray was used only as a

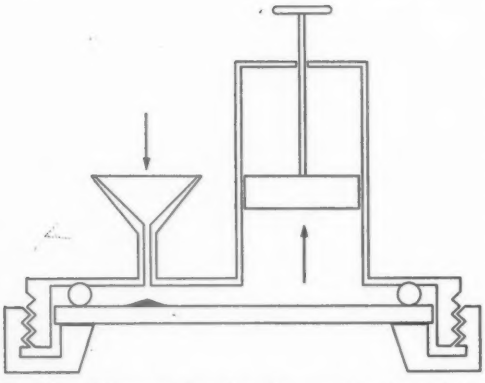


FIG. 7.—*Diagram showing the construction of the Konimeter instrument.*

matter of interest. It is not pretended that this device in itself is sufficient to render the atmosphere innocuous, but rather it is put forward as an indication that a considerable improvement in conditions can be effected without a major expense.

(4) *Fettling*

The most dangerous operation in fettling is grinding, whereby sand particles which have become embedded in the casting are removed by severe mechanical abrasion. According to modern views on the mechanism of silicosis, the worst conditions are to be found under such circumstances. Here again, if the sand did not become attached to the metal, no such grinding would be necessary and no dust produced. Obviously, any improvement in the moulding sand should result in an improvement in the casting skin and steps in this direction can often be justified on economic as well as health grounds.

Dust Removal

So much for dust suppression; it now has to be considered what can be done to remove from the atmosphere of the foundry the dust that is inevitably formed. There are two ways of tackling this problem. First, there is the general way in which the whole shop is provided with adequate ventilation. This method is, of course, an expensive one and has the big disadvantage that in the interval between the formation of the dust and its removal from the shop, large quantities of it may still be breathed by the workmen involved. In addition, the very large volumes of air involved would necessitate some form of additional space-heating in the shop.

The second method is of course the provision of individual extraction units for each of the dust-producing operations. At first sight this would appear to be a comparatively simple operation, but bitter experience is that ventilation engineering appears to be more of an art than a science and large sums of money have been spent on extraction systems which although theoretically sound have given poor results in practice. In fairness to the ventilation engineer, however, it must be pointed out that considerable reductions in efficiency of extraction equipment can be caused by the carelessness of workmen and management alike. An odd steel sheet missing from the roof, a new door knocked in the end of the shop, alteration in production line—all can have a bearing, and it is becoming increasingly obvious that foundry managements will either have to consult engineers with the necessary knowledge and experience or learn the basic principles for themselves so that they may be in a better position to predict the impact of all forms of shop alterations on their ventilation systems. In this connection, the use of smoke bombs offers an inexpensive method of investigating small ventilation systems.

The knock-out which by virtue of its dust producing propensity occupies the pride of place in the new foundry regulations is an obvious case for local ventilation. Although many knock-outs have been equipped with ventilation systems, much remains to be done before ventilation of these trouble spots can be considered to be on a sound basis, and in fact the British Cast Iron Research Association has in progress a research programme which has this aim. The ventilation of grinding equipment has been the subject of successful research work by both the British Cast Iron Research Association and the British Steel Castings Research Association and by following the recommended designs it should be possible to eliminate many pieces of grinding equipment from the stigma of being atmospheric polluters.

Disposal

This section would not be complete without a word or two on what happens to the dust after it leaves the shop. Too often, the dust-laden air is simply removed from the shop at one point and returned to it at another, and this applies particularly to the smaller size ranges of dust, as they are not readily retained in any filtering equipment. Centrifugal separators are very successful in collecting the larger-size particles, but as the particle size decreases so does the efficiency, and more of the smaller particles are simply discharged to the atmosphere. The increase in the ventilation which is inevitable over the next few years may mean that unless effective dust arrestors are installed, then extraction equipment will merely become circulators of small-diameter air-borne dust particles.

Fig. 8 gives some idea of the efficiency to be expected from the more common methods of removing dust from air. It will be seen that at a diameter of 15 microns an electrostatic precipitator is 100 per cent. efficient, a cloth filter 93 per cent., multiple cyclones 40 per cent., and an ordinary cyclone, most inefficient. At a diameter of 1 micron, the electrostatic precipitator is still 100 per cent. efficient, the efficiency of the cloth filter has dropped to 85 per cent., and neither the multiple nor the single cyclone is at all effective.

Generally speaking, the efficiency of wet methods of separation can be taken as lying somewhere between a cloth filter and the electrostatic precipitator. Needless to say, as the efficiency increases so does the cost, but removal of dust from the exhaust air is rapidly becoming a prime necessity if the full value of shop ventilation is

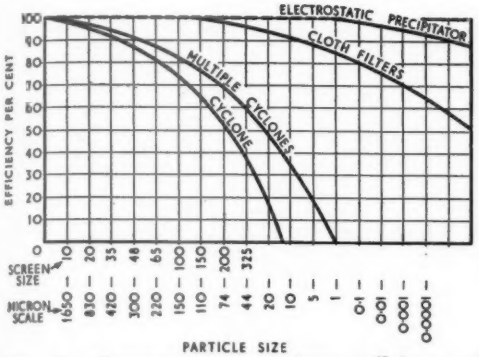


FIG. 8.—*Comparative approximate efficiency of various types of dust-suppression equipment for various particle sizes and average specific gravity* (1 *micron* = *approx.* 0.00004 *in.*).

to be reflected in the health of the workpeople. At the same time, the Authors wish to avoid the impression that iron foundries are the only sources of atmospheric pollution. In fact in many districts the air outside the shops is so badly polluted with dust and fumes from domestic fires that the conditions in the foundry may appear to be far worse from the industry's point of view than is actually the case. In one industrial town in which one of the Stanton works is situated, dust counts outside the town hall gave results of about 400 particles per ml. The town hall is quite a distance from the major industrial district and in the centre of this district the figures obtained were in the region of 800 particles per ml. It is understood that similar figures have been obtained elsewhere in the country and this high level of atmospheric pollution probably explains the reluctance of the Ministry of Labour and National Service to legislate for a definite standard of industrial atmosphere.

Acknowledgments are gratefully recorded to Stanton Ironworks Company, Limited, for permission to publish this Paper.

Dublin Foundry Company's Preference Issue

The Industrial Credit Company, Limited, are offering for sale 100,000 6½ per cent. cumulative preference shares of £1 each of Tonge McGloughlin (Holdings), Limited, Tonge and Taggart, Limited, and J. & C. McGloughlin Limited, both of which concerns are well known and old established Dublin companies with whose management descendants of the founders are still associated. Tonge and Taggart, Limited is one of the largest ironfounders in Ireland, and has two extensive and well-equipped foundries. J. & C. McGloughlin, Limited, also has two separate metal factories, one fabricating structural steelwork, and the other devoted to art-metal works and the manufacture of numerous metal products. Between them the two companies employ about 400 workers.

The association of the companies will facilitate the invitation of additional capital for expansion, and will have the added advantage of securing the benefits of close co-operation and unified control, while enabling the companies to preserve their separate identities for trading purposes.

Publications Received

"Why Productivity?" (B.P.C. Action Pamphlet No. 1.) Issued by the British Productivity Council, 21, Tothill Street, London, S.W.1. Price 1s. net.

Up to now, the publications of the British Productivity Council and its predecessor have been essentially technical. This new one breaks new ground and logically sets out the case for increased productivity as it affects the whole economy of the country. Considering the composition of the Productivity Council, it represents a statement of high importance. Moreover, it is written in simple terms, and, because of this, is suitable for the widest possible circulation. However, it is by no means addressed to the employee, for its underlying principles need assimilation by management. The reviewers recommend that this pamphlet should be bought by everybody in the industry.

Journal of Research and Development, Vol. 5, No. 5. Published by the British Cast Iron Research Association, Alvechurch, Nr. Birmingham.

This issue contains four papers, respectively, on magnetic and electrical properties; temper embrittlement of blackheart malleable and nodular irons; influence of mould factors on casting defects, and behaviour of sand mixtures under load at ordinary and elevated temperature, all by members of the staff of the Association. The first, which occupies 60 per cent. of the issue, is by Mr. M. H. Hillman, and is most important, for it puts on record data on a subject concerning which research in this country has indeed been laggardly. The list of references quotes only 26 publications in world technical literature since 1895, yet the reviewer is well aware that numerous castings in this country are regularly purchased subject to magnetic-property testing. Of significance in this respect is the choice of specimen shape by the author, which renders individual coil winding a necessity, whereas possibly other designs could be used with only small added inaccuracy and without necessitating individual winding. However, a very useful start has been made and the writer looks forward to seeing further practical applications of the work—for instance, a method of checking of completeness of annealing or the presence of hard spots on repetition castings.

The second paper, by Mr. G. N. J. Gilbert on temper embrittlement, throws much further light on a subject which has long been recognized as a feature attendant upon rates of transition through certain phases during heat-treatment. Malleable iron to be galvanized has been a source of trouble in this respect and the phenomena occuring with this material, as well as nodular-graphite irons, have been investigated. Conditions analogous to those for hardened and tempered low-alloy steels are reported. For the third paper, on casting defects and mould factors, by Mr. J. H. Gittus, the reviewer deems the detailed disclosure of research method more noteworthy than the intrinsic results presented, for these tend to be of too sweeping a nature. However, a most elaborate series of experiments has been devised for the research, and the future should show more applications to actual foundry practice. In the final paper, Mr. R. G. Godding and Mr. R. Rew present a number of interim results obtained from newly-constructed apparatus devised to measure thermal effects on moulding sands, particularly as regards expansion and contraction. In doing so, a big field and one of major interest to founders has been opened up. It is one, too, on which to-date there has been a plethora of purely empirical information.

R. & A. Main Limited

New Research Block Opened

A new and extensive research block was recently opened at the Edmonton works of R. & A. Main, Limited. Covering a site area of approximately 10,000 sq. ft., this new building incorporates many interesting constructional features.

It is axiomatic that an industry cannot prosper unless it is continually abreast of the latest developments in research, and in the gas industry it is likely, as time goes on, that more and more intensive competition will be met from industries using other fuels. That R. & A. Main, as one of the leading manufacturers of gas-using appliances, are fully alive to this problem is evidenced by these new research facilities.

The old Edmonton laboratories had to be converted to augment the canteen when the latter was bombed during the war, and they are still used for this purpose. This led to the planning of the new department, and much careful thought has been given to its design. Features of particular interest are an acoustically tiled ceiling and double-glass partition in the workshop, insulated hot rooms to maintain constant temperatures for refrigerator testing, and special flue constructions for fire testing.

Relation to Production

The Glover & Main policy has always been to link production with research; to carry out research within the works that is ultimately going to manufacture the particular article under development. By this means, appliances are developed with a full knowledge of production requirements and, in consequence, the ultimate cost is a truly economic one, as most of the usual production problems are foreseen and overcome before each appliance is handed to the production department.

Therefore, at R. & A. Main's Falkirk factory the research department is responsible for all industrial canteen equipment; at Thos. Glover's the development is centred on meters, both industrial and domestic; at Croydon the research department is engaged on research on all types of water-heaters, instantaneous and storage. At Edmonton the research is divided into three separate sections, domestic cookers, space heaters and refrigerators.

The new research block has been built above part of the existing works on a site previously occupied by three north-light truss roofed bays 30 ft. long, and allows direct access to both works and offices. The external appearance conforms to that of the existing general office block. The roof is flat, made of precast hollow beams, and waterproofed with screeding and asphalt.

Heating and ventilating is provided by a combined radiator and plenum system, the main duct running at ceiling level along the main corridor with branches into each laboratory as required. The heater battery is of the hot-water type and air temperature is controlled by a damper system which allows either fresh or recirculated air to enter the building.

Specialized Laboratories

The refrigerator laboratory incorporates two controlled-temperature rooms. Constructed of hollow brick partitions filled with slag wool and with doors 3 in. thick, with flat-asbestos and slag-wool filling, these rooms are used for the testing of refrigerators at a variety of ambient temperatures. Those normally employed are 70 and 95 deg. F., but tests can be carried out at temperatures up to 120 deg. F. In addition, cooling facilities are provided so that in hot weather the ambient temperature may be controlled at 70 deg. F.

The cooker laboratory is a large one where development work on cookers generally can be investigated. The fire laboratory is fully equipped for doing complete heat balances on any type of gas fire. A large research kitchen is incorporated in the general layout.

The chemical laboratory is well equipped to provide routine control for works manufacturing processes and a smaller laboratory is devoted solely to research on thermostats.

The experimental workshop is so arranged as to enable prototypes to be constructed completely in the department except that castings have to be finished. To prevent the noise of constant hammering from travelling through the building, the ceiling of this workshop is covered with sound-absorbing tiles and the windows between the workshop and the adjacent laboratory are fitted with double glass. 24-oz. glass was used on the interior of the workshop with 32-oz. glass for the exterior, thus preventing the harmonic waves which would have been present had similar weight glasses been used. A further small laboratory, used for "life" testing, and the drawing office, containing the usual drafting equipment, complete the research department.

In the interests of efficiency and economy, the measuring instruments are grouped in a central instrument laboratory and can be used to give results from any of the other laboratories. Among other items of modern equipment, this department contains a vernier potentiometer to which is connected banks of thermocouples running from the other laboratories. For instance, 144 thermocouples lead to the refrigerator laboratory and any one can be connected to the potentiometer by a system of switches.

R. & A. Main have set themselves an ambitious development programme; in fact they are already considering appliances which will not be ready for the market until 1958. Each year planning is carried further and further ahead.

Purchase Tax

Tax-free Exports by Post

Notice No. 77G (Tax-free exports by post—evidence of posting), issued by the Commissioners of Customs and Excise, has been revised and copies of the new edition are being sent to traders registered for Purchase Tax purposes.

The new edition contains details of certain relaxations which, in consultation with representatives of trade and of a value not exceeding £1 and (*b*) simplification of procedure introduced on November 2, 1953. Briefly these modifications, which can be operated forthwith, concern (*a*) waiver of the use of special forms of Certificate of Posting for postal packages containing chargeable goods of a value not exceeding £1, and (*b*) simplification of procedure in the case of group postings.

Purchase-tax Coupon Scheme

The Commissioners of Customs and Excise remind traders that the period of validity of coupons under the above scheme, which was terminated on December 31, 1953, was six months from the date of issue. Accordingly, the latest date of validity of coupons issued under the scheme was June 30, 1954; credits in respect of Purchase Tax cannot, of course, be allowed on sales made against any time-expired coupons.

AT the 12th annual general meeting of the Irish Ironfounders' Association, the following elections were made:—As *chairman*, Mr. S. W. Aitkin (Hammond Lane Ironfounders, Limited); as *vice-president*, P. J. Lawless (Wexford Engineering Company, Limited).

Shell-moulding Association

At a meeting held in Birmingham on June 30, over which Mr. George Skript presided, the declared object was to decide whether or not a shell-moulding association should be established.

In opening the meeting, THE CHAIRMAN pointed out that trade associations existed for iron, steel, non-ferrous and light-alloy founders, and was of the opinion that because shell-moulding was so new and its potentialities so vast it warranted a separate organization. He had just returned from America, where he noticed considerable progress on the production side of shell moulding. There was leeway to make up in this country, and a team made up of resin makers, plant manufacturers and the actual founders would be beneficial. The objects of the proposed association were (1) to issue collective information on shell moulding and the various processes which would assist members to develop and exploit these commercially; (2) to create facilities with a view to advising members on technical, commercial and legal aspects of the shell moulding and allied processes; (3) to promote co-operation between shell moulders and manufacturers or producers of plant and material which are used in the process; and (4) collectively, to take such action as may be necessary to safeguard the interests of members and to ensure that the use of basic processes is available to all. The chairman envisaged a strong technical committee; the creation of better information on costs; and unification in the matter of labour designation.

Discussion

MR. KEENAN (Keenan, Beck, Keller & Company), speaking as a manufacturer of resin, supported the formation of the proposed association as he felt from this angle it would assist in the mutual understanding of the techniques of the process.

DR. POLLARD (Blackburn and Oliver) also a resin manufacturer, supported the proposition. Speaking of alleged size limitations, he said he had been associated with the making of castings by the shell-moulding process up to half a ton in weight.

MR. FRANK MARTIN (Samuel Osborn & Company, Limited and past-chairman of the British Steel Founders' Association) said a shell-moulding association to look after the interests of founders would be welcomed if the founders needed some special care which no organizations existed to provide, but if the founders needed no special care and protection and if established and reputable associations provided what was wanted, then no sensible foundryman would add to his expenses and troubles by forming another association. The latter would first demand subscriptions and then require him to endorse the decisions of an executive committee. He suggested that the best people to consult as to whether existing associations could give the requisite services, were those actual bodies. That method had not been followed in this case. The objects as set out, were, in his view, largely covered by the objects of existing associations, except for "legal aid." In this connection, the basic Patents were public property. There might be complications in the field of plant, but, speaking as a founder, he cared very little what the makers of machines found to squabble about, but he was very concerned whether the name "Shell-moulding Association" was going to be used by people, who really practised shell-moulding or who just told people to use their machines. It was a feature of British patent law, that it was unsafe to assume a Patent was valid, until it had been tested in Court. That meant the litigation which was costly; thus intending members must be assured that their subscriptions could not be so devoted.

Polygram Position

LORD DOUGLAS, speaking on behalf of the Polygram Casting Company, Limited, said that his company had two interests—one as holders of a considerable number of Patents and the other as shell-moulding plant manufacturers. The former had been deemed to be obscure, due to the fact that the process of obtaining Patents was slow and moreover, opposition to certain applications caused additional delays. A programme of research had been sustained upon which between £50,000 and £100,000 had been spent.

THE CHAIRMAN, intervening, said this was deviating from the subject under discussion which was, "Is it worth while to form an association or is it not?"

LORD DOUGLAS, intimating that his remarks were relevant under the heading of the "legal aspect of shell moulding," said his company had adopted a liberal view. The interest of his company in this matter was not merely as holders of process patent rights but as developers of plant for the process. There was a desire to sell as many machines as possible which implied a healthy and continuous use of the process. His firm had looked with suspicion upon the proposals to form the association as the chairman and some members of the provisional committee were associated with a company which had opposed Polygram Patent applications. If the association to be formed was conducted on lines essentially fair and impartial, his company was willing to join, but the position required clarification.

THE CHAIRMAN said the proposed body was to be considered as trade association to serve a rapidly growing foundry development and its formation required consultation on a very wide scale. Foundrymen would need a certain guidance if growth was not to be checked, and therefore he did not think that the emphasis on the last item was really justified.

MR. MARTIN asked for a categorical statement on the "legal aspect" clause, such as he had dealt with earlier.

THE CHAIRMAN said he was not in a position to give this, as the proposition was still amorphous, and such a definition of policy must await proper incorporation. The fact that the committee had sent invitations to the Polygram concern and its friends indicated that nothing fixed was in their minds and he saw no reason why the various interested parties should not join such a trade association.

MR. HYSLOP (Phosphor Bronze Company, Limited) referred to the technical committee of Association of Bronze and Brass Founders, which he said was capable of investigating shell moulding. No doubt, too, there were similar committees associated with steel and ironfounding, and he asked whether these bodies had been asked to co-operate in the proposed association.

THE CHAIRMAN said that so far as he was aware no approach had been made, but it was discussed at the preliminary meeting. No doubt such approaches would be made.

MR. HYSLOP pointed out that a technical officer of the British Non-Ferrous Metals Research Association had been appointed and was being trained specifically

Shell-moulding Association

to deal with shell moulding. This indicated overlapping of interests.

THE CHAIRMAN thought, as similar action might be taken by other foundry associations, duplication of effort might be overcome by the formation of a shell-moulding association.

MR. HYSLOP suggested that that was the kind of duplication necessary for a new process, as a method applied to one alloy behaved differently when used for a second. Since no such approach had been made, he deemed it a waste of time attending and forming a new association.

MR. MARSLAND (Newman, Hender & Company, Limited) stressed the notion that an approach to existing associations should have been made before calling the meeting.

MR. CHUBB (Fairbairn Lawson Combe Barbour, Limited), who said his firm were both foundry owners and makers of shell-moulding equipment, stressed the need for information on the patent situation throughout the world. So far as power to take up legal matters was concerned, he would need to consult his Board before committing himself. He supported the formation of an association.

MR. F. N. LLOYD (Lloyds (Burton), Limited and chairman of the British Steel Founders' Association) thought there were already too many associations of various types. So far as steelfounding was concerned, the employers' and the research associations were regarded as giving a comprehensive service. He criticized the methods used by the organizers, they should have approached the trade associations first, as the present meeting had given rise to suspicions—which might be quite unjustified—that it related to a private patent disagreements. Finally, he advocated consultation with the other recognized associations before any further steps were taken.

THE CHAIRMAN, summing up, thought the legal aspect had been too strongly stressed; that there *was* a desire to form another group or association but that consultation with existing associations might have obviated the need for a new society. That, he thought, was controversial, for the agendas of existing associations were so large, that a subject such as shell-moulding was apt to be adjourned. The criticism that no approach to the existing associations had been made was perhaps justified, but still it was difficult to negotiate until there was a body formed to make such an approach. He adhered to the proposal that suppliers and users should get together as a team.

MR. KEENAN, before the matter was put to the vote, and to obviate any notion that resin suppliers were being " pushful," suggested that they should abstain from voting.

THE CHAIRMAN, putting the vote to the meeting, said about 95 firms had expressed their inability to attend, so that it was perhaps not fully representative.

The voting resulted in 21 in favour of forming an association and 19 against, a predominating number abstaining.

Gjuteriet—the Swedish foundry magazine—for June, carries a report on recommendations for drying stoves. The English summary states that a joint committee of *Jernkontoret* and *Sveriges Mekanförbund* has for several years been making investigations into a suitable design for drying stoves for moulds and cores. As a result of these, brief recommendations are given for the design of such stoves. Electric, as well as solid-fuel-fired stoves, are discussed.

Parliamentary

Higher Technological Education

A statement on higher technological education was made by MR. R. A. BUTLER, Chancellor of the Exchequer, in the House of Commons on July 13. He announced that he had approved plans for developments outside London. The main centres would be Glasgow, Manchester, Leeds, and Birmingham, but provision was made for developments elsewhere. He had come to this decision after considering recommendations by the University Grants Committee, made in response to his request last July. The developments would take place at institutions already in receipt of recurrent grants.

Moving the third reading of the Bill in the House on July 12, MR. JOHN BOYD-CARPENTER (Con.) said that the biggest change had been in the introduction of the new investment allowance. It would be wrong to assume that in the immediate future investment would necessarily show a spectacular rise, but he believed the allowance would contribute a great deal to producing an intellectual climate in which there would be far greater willingness and enterprise in investment, in that way assisting British industry in meeting the difficulties facing it. It was a matter of great satisfaction that the shipping industry would secure some real assistance from this provision.

Industrial Research

MR. ELLIS SMITH asked the Chancellor of the Exchequer in view of the fact that the Exchequer now contributed to industrial research both directly through the Department of Scientific and Industrial Research and indirectly through remissions of taxation, what steps were taken, or were contemplated, to ensure that the results of such research benefited British industry and not that of our competitors; and how many applications had the D.S.I.R. received for assistance from firms manufacturing in co-operation with British, German, and Japanese firms.

In reply, the CHANCELLOR OF THE EXCHEQUER (Mr. R. A. Butler) said that, in addition to published information, the D.S.I.R. helped British industry by making its unpublished scientific and technical information and experience freely available to genuine British inquirers. This supplementary assistance was not available in the same way to foreign undertakings. He regretted that he had no information on the last part of the question.

Safety Boots

Conditions for Acceptance by Chief Inspector

Under the terms of a national agreement the safety boots to be provided by the employer have to be of a type acceptable to H.M. Chief Inspector of Factories. The Chief Inspector has announced that he is prepared to accept as one of the types of boots " A boot complying with B.S. 1870 (1952) and with grade I of B.S. 953 (1952) and having a front flap to cover the lace holes to prevent the entry of molten metal." Under item 17 of B.S. 1870 the boot must be clearly marked as follows:—

(i) with the number of the British Standard, *i.e.*, 1870;
(ii) with the name, trade mark, or other means of identification of the maker;
(iii) with the certification mark of the British Standards Institution.

Copies of the above standards are available from the British Standards Institution Publications Department, 2, Park Street, London, W.1. Both standards cost 2s. 6d. each exclusive of postage.

Simple Foundry Expedients Proved Worthwhile in Recent Years*

By J. E. O. Little

In all foundries, at various times, simple ideas are adopted to improve details of practice. These are very often small, individually, but when collected together have a total value which is sometimes not appreciated. This Paper takes the form of a collection of these ideas taken from the foundries of two firms—Glenfield & Kennedy, and J. W. Blakeborough & Sons. Major developments have not been included because, for the most part, they follow general practice and are common knowledge. It is felt that much of the interest in a visit to a foundry arises from seeing novel ideas being used, but obviously there are frequently some which are not evident at the time of a particular visit. Some of the ideas which follow were necessary because existing equipment was called upon to handle increased output or had to be adapted to suit the working of a mechanized plant. In some instances accident prevention promotes the adoption of simple innovations, and the reduction of accidents is worth all the consideration that can be given. Here, then, are eighteen examples, given in the hope that some at least may be found useful to other foundrymen should occasion arise.

Pouring on the mechanized plant is done with 5-cwt. capacity ladles, and, because the moulds being cast have large variations in size, the time required for emptying varies considerably. Consequently, a receiver is needed at the cupola capable of smoothing out the variations. However, to instal a proper receiver would have meant raising the cupolas, charging platform, and charging equipment, and the expense involved would have been excessive. A normal tilting spout was not considered adequate, but a spout of this type was made with the cupola end of it considerably broadened so that it was sufficiently large to hold 10 cwts. of metal, and this is illustrated in Figs. 1 and 2. It rests on pivots at the furnace end, and the open end is raised or lowered by means of a single acting air hoist. The requirements are adequately met with the arrangement, and the single acting hoist, fitted well away from the heat, is so simple that its reliability is a valuable feature.

Tap-hole Difficulty

At some time or other, all founders have experienced a hard tap-hole. If everything is kept to perfection this trouble should be rare, but it does occur, particularly when metal of low fluidity is required at an early stage in the day's blow. When a

* Presented at the fifty-first annual meeting of the Institute of British Foundrymen, held in Glasgow.

FIG. 1.—*Hinged end of a tilting spout at the cupola to serve as a reservoir of variable capacity.*

FIG. 2.—*General view of the tilting spout showing the broad rear portion and lifting chains.*

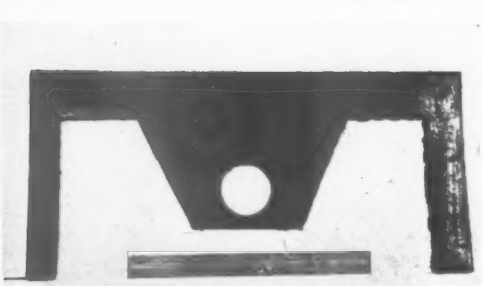


FIG. 3.—*Supporting plate for ramming an emergency tap-hole.*

hard hole occurs, the first endeavour to clear it is to hammer-in the pricker bar. When this fails an oxygen lance is used, but this can also fail and ultimately the hole may become severely damaged before the hard "plug" can be removed. This, of course, entails a difficult day for the tapper, who has to control his taps from a hole which is far too large.

When such a case occurs a dummy tap-hole outside the shell of the furnace may be contrived. A lug is provided at each side of the tapping spout and a plate is kept handy which fits against the lugs. This plate has a hole in the middle through which a new tap-hole is formed. After draining the furnace, the damaged hole is roughly tidied up and a bed of patching material is rammed in the bottom of the spout with the plate in position. This is shown in Fig. 3. A tube, the diameter of the required hole and filled with blacking, is laid in with one end through the plate and finally completely rammed round with patching material, as is illustrated in Fig. 4. The hole thus formed has proved just as satisfactory as the normal tap-hole made inside the furnace.

FIG. 4.—*Emergency tap-hole prepared ready for use.*

Protection for Drop-bottom Doors

When the bottom doors of the cupola are dropped, they hang down vertically from the hinges and the white-hot coke bed falls against them. By the time this has been quenched, the edges of the doors become heated excessively, and, after a relatively short time of such repeated treatment become very much distorted, which makes them awkward to close. A pair of bow-shaped springs have been fitted to each side of the bottom plate of the cupola and these have tapered pads welded on the tips which act as catches for the doors when they swing back. The doors are thus kept well out of the way of the hot, dropped coke, and since the catches were fitted no renewal of doors has been required. Figs. 5 and 6 show the springs in use.

High-chromium Iron

In one iron foundry with which the Author is connected, a coke-fired tilting crucible furnace is available for making small melts of high-alloy iron. It was desired on a limited number of occasions to make an iron containing 30 per cent. chromium for a very special purpose on one of the firm's products. The most desirable method of melting this alloy is in an electric furnace, but the small number of heats required did not warrant the cost of such equipment. The coke-fired crucible furnace was adequate to melt the alloy, but endeavours to raise the temperature high enough for casting resulted in a prolonged melting period, which caused a high carbon pick-up. It was found, however, that a small admission of oxygen to the intake of the fan of the furnace during the superheating period speeded up the melting process and stopped the rapid carbon pick-up.

Carbon contents between 0.5 per cent. and 1.0 per cent are now normally obtained, and these are not excessive for the purpose for which the metal is required. The superheating period is about 40 min., during which 200 cub. ft. of oxygen are used. This costs 6s. 5d. for a heat of 400 lb. of metal and in view of the value of this particular alloy the extra expense of the oxygen is negligible. Care is required to avoid admitting the oxygen too rapidly, because excessively high local temperatures cause fusion of the coke ash, which tends to make the fire burn hollow.

Hangers

For several years, all the hangers required in the iron foundries concerned in this account have been cast in turnover chill moulds. The equipment was constructed to economize time, space, and manpower, normally expended in their production. Previously a man could level a bed, stamp, and cast about twenty dozen hangers in four hours. A labourer now casts sixty dozen in the same time from the chills. By this method, hangers are always

FIG. 5.—*Spring catches in use for holding back the cupola drop-bottom doors.*

FIG. 6.—*Spring catches, showing the pads which catch the doors when the furnace is dropped.*

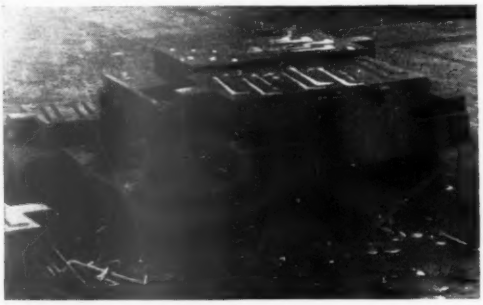
readily available as they can be cast at very short notice. The chills (Fig. 7) are sited near the cupolas, and the hangers are cast from hand ladles filled from passing bogey ladles of metal. No machining is necessary in the construction. Some of the smaller standard core irons are also produced in this way.

Chilled Rollers

The rollers required for some types of sluice gate are required in large numbers and the manufacture of these involves a different use of chills which is perhaps more interesting. The rollers vary somewhat in dimension, but the average type is 8-in. dia. by 10 in. long, and has a 2-in. dia. hole through it. The castings must be machinable, but as hard as possible so as to withstand wear. Previously, they were cast in dry-sand moulds using a low-silicon metal which made them prone to " draw " defects, and in consequence were made with almost as much head as casting.

They are now cast solid in a simple split chill mould (Fig. 8), using an iron which is approximately of eutectic composition, and being chilled becomes sufficiently hard for the job, but is still grey and machinable. With this composition of metal no draws occur and therefore a head is not necessary. The resulting casting, Fig. 9, has $\frac{3}{16}$-in. machining allowance on the bottom and sides and $\frac{1}{4}$-in. on the top. The hole is drilled at the same time as the periphery is being turned so no extra machining time is involved. The first castings of the day, cast in the cold chills, were inclined to have white iron at the corners so it is now the practice to add $\frac{1}{4}$ per cent. of copper to the first ladle of metal of the cast and this trouble is eliminated. When made in sand moulds, with a feeder head, the castings cost 2s. 9d. in wages, whereas now a labourer is paid 2d. each for pouring the metal and emptying the chills.

FIG. 7.—*Chill moulds for producing flanger irons. They are used entirely without machining.*



Rotary Furnace

An oil-fired rotary furnace is used to melt down large heads which have been cut off heavy castings used for hydraulic applications. The opportunity is taken when so doing to impart to this metal a very high superheat, so that it can be used to raise the temperature of cupola metal, by adding it to the total metal being collected for casting heavy work. Trouble was experienced when tapping this high-temperature metal, due to the normal ladle daubing being inadequate to withstand impingement of the

FIG. 8.—*Roller chills showing the method of casting with a flat top part.*

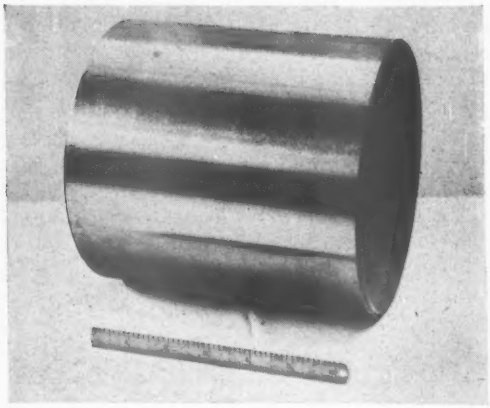


FIG. 9.—*Finished roller, cast in a chill mould.*

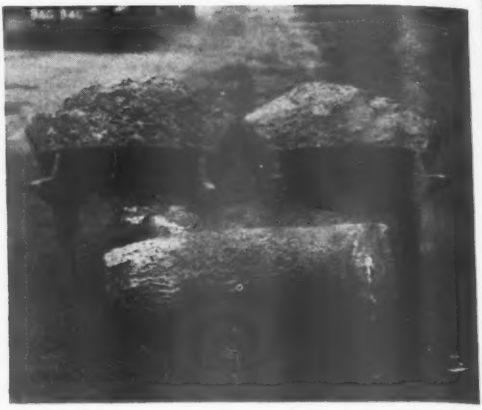


FIG. 10.—*Mixture taken to the pan mill for the special ladle refractory. It consists of barrow-loads of rock sand and sea sand and two old plumbago crucibles.*

very hot stream. A special refractory was, therefore, developed comprising old plumbago crucibles from the brass foundry crushed in a pan mill and one part of this ground up with two parts of the normal ladle daubing (Fig. 10). The linings produced from this mixture are extremely durable, and slag does not adhere to them as readily as to the plain linings. A certain amount of increased thermal conductivity is noticed, but the scone brick backing in the ladles makes this of no consequence.

Delayed Break-down of Core-sand

In one plant, the majority of the castings produced on the mechanized plant are required for valves and, in consequence, are all cored. To keep down the cost of the oil-sand consumed, the mixture used is one in which the cereal and oil additions are kept to a minimum. The core, therefore, breaks down very readily after casting with the result that much sea sand becomes mixed with the green-sand at the shake-out machines. Some of this sea sand is desired along with rock-sand additions to maintain the bulk of sand in the system.

However, the requirements for addition to the bulk of sand vary from time to time and the amount

FIG. 11.—*Moulding box lifted by the pin-lift machine with the take-off hooks engaged.*

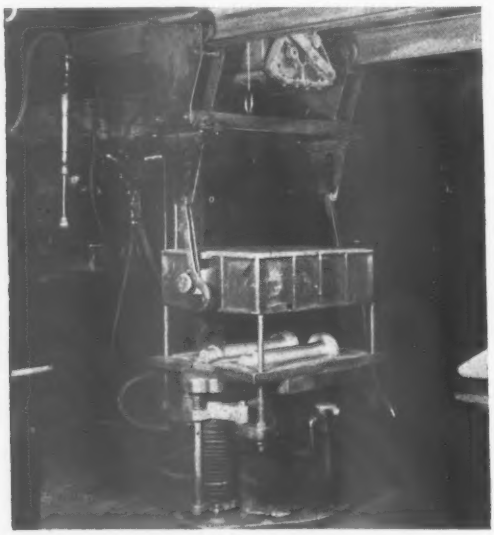


FIG. 12.—*Box moved on the hooks to the roller conveyor.*

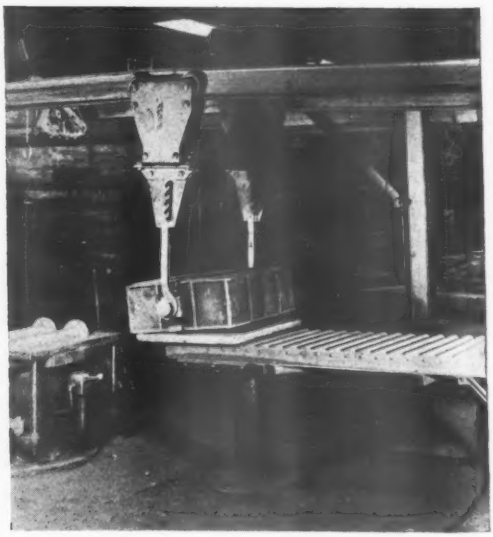


FIG. 13.—*Roller conveyor engaging the box and releasing the hooks.*

of sea sand wanted through the shake-out needs adjusting. It is found that this can be done very nicely by using a small molasses addition to the oil-sand mixture. This may range from ¼ to ¾ per cent.

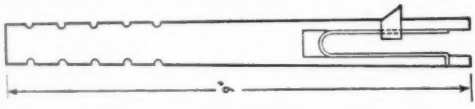
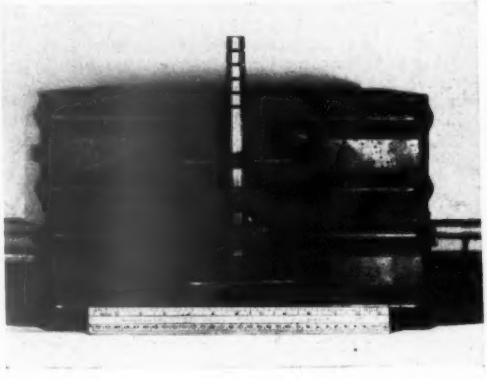


FIG. 14.—*Box pin fitted with a spring nipple.*

and the effect is that the molasses varies the rapidity with which the core prints are burnt. If the most of the print is not burnt by the time the casting reaches the shake-out then it acts as a stopper for

FIG. 15.—*Moulding box with a spring-nipple pin in position.*



long enough to prevent the fully burnt sea sand inside the core from entering the sand system.

With further time, the core disintegrates, but by then it is past the stage where the sea sand would go through the shake-out. The sand control section can, therefore, keep quite a good adjustment of the quantity of bulk sand merely by manipulating the molasses content of the core-sand mixture.

Moulding Improvements

For moulding-machine equipment, a simple take-off arrangement from pin-lift machines is worthy of description. Overhead girders extending from the machine carry a trolley from which two hooks are suspended, the ends of the girders remote from the moulding machine being slightly lower than the other ends. When the pattern is drawn and the moulding box is left resting on the pins of the pin-lift machine in their elevated position, the height of the suspended hooks is arranged so that they will just engage with the trunnions on the box. Then, when the lifting pins on the machine are retracted, the box is left hanging on the trolley which is then run down the sloping girders until it is arrested gently on a piece of elevated roller conveyor. An air cylinder then lowers it to the main conveyor for closing. The arrangement has the advantage that no actual hoisting is required to lift the box away from the moulding machine, and in consequence the gadget is speedy in use. The method is shown in Figs. 11, 12 and 13.

In the production of moulds from a pair of machines, the boxes are closed with loose pins. The pins are inserted in the drag bushes and to avoid having boxes with different bush sizes for top and drag the closing pins are fitted with small spring-loaded nipples, to prevent them slipping through the drag bushes. The illustration (Fig. 14) shows the shape of these nipples and the light nature of the spring behind them. Pins having this arrangement are easily withdrawn through the top bush after clamping the closed mould (Fig. 15).

(To be Continued)

Founder's Amalgamation

A scheme to merge completely the businesses of two very old firms of non-ferrous founders is shortly to be submitted to shareholders. The firms concerned—both in the Stoke-on-Trent area—are T. M. Birkett & Sons, Limited, and Billington & Newton, Limited.

It will be recalled that Billington & Newton became a fully owned subsidiary of T. M. Birkett & Sons, in 1947. Since that time the two firms have worked in close co-operation. Under the new scheme the foundries at Hanley and Longport will continue to operate as before under the same staff and management, although the business of both firms will in future be conducted under the name of T. M. Birkett, Billington & Newton, Limited.

I.B.F. Conference Fund

In addition to the subscriptions to the Glasgow conference fund of the Institute of British Foundrymen published previously in the JOURNAL, the following donations have been received:—J. G. Lowe, Esq., £26 5s.; Thomas Steven, Esq., £2 2s. The grand total of subscriptions to the fund amounted to £4,271 6s.

Exports Credits Guarantees

When he visited the Midlands on July 8, Mr. Rowland Owen, comptroller general of the Government's Export Credits Guarantee Department, said that the department was out to increase its business to "spread the risk", and during the last six weeks had re-introduced cover for exports to Brazil—there was now a complete coverage for exports to all South American countries. One of the chief tasks is to induce more smaller firms to approach this form of insurance with an open mind, Mr. Owen said. The department could offer an insurance against the major financial risks of exporting to enable exporters to take on new customers with confidence, offer competitive credit terms and maintain business in the more difficult markets. During the Brazilian exchange troubles of the last two years, the department paid out £23,000,000 to British exporters who became caught up in the crisis. Knowing they were insured, policy holders were able to continue trading with Brazil long after uninsured exporters had been turning away orders.

It had been proved that the Government insurance increased manufacturers' dollar-earning business with North America, Mr. Owen said. On an average, firms covered by the department had more than doubled their annual North American trade. Despite the increase in business, however, the department still only provided cover for 14 per cent. of the total volume of British exports. There was a trend though, for the British business man to offer more extended credit terms in order to compete with other manufacturing countries and the department was anxious to provide backing. Up to four years credit on exports was by no means unusual to-day, he said.

Mr. Owen, who became head of the department last year, is visiting the provinces in order to meet industrialists and discuss with them export problems. He is seeking suggestions for improving and extending the work of his department in the service of industry.

Inquest Report

The inquest on Horace Percival Smith, 56-year-old experimental department manager of Rolls-Royce, Limited, who died from burns after being splashed with molten metal when watching a centrifugal casting process at the Garter Street works of Firth Vickers Stain'ess Steels, Limited, Sheffield, was held at Sheffield on July 12. A verdict of "accidental death" was returned.

The foreman-in-charge, stated that he had given verbal instructions that the mould cover should be secured by eight pins when the casting weighed up to 8 cwt. The full twelve should have been used above that figure. The casting at the time of the accident weighed 872 lb., and the machineman had used only four pins as he had been doing all the week. The chargehand said he had not received any instructions, written or otherwise. He was unaware that only four pins had been used.

Mr. A. P. Lockwood, the Coroner, said that there seemed to be a lack of co-operation and liaison, although it was stated that they worked as a team. The molten metal escaped because of the inadequate securing of the cover plate. He added that he hoped that as a result of this accident better precautions would be taken by those in managerial positions downwards. As a result of a lack of adequate precautions a man had been fatally injured, but there had been nothing criminal, he concluded.

Protective Coatings

The study of various types of coating for protection of iron and steel against corrosion was the subject of a two-day technical meeting held in Brussels when, at the invitation of the Belgian Committee No. 4 of the *Association Belge pour l'Etude, l'Essai et l'Emploi des Materiaux* (A.B.E.M.), a programme of technical sessions and visits was planned jointly with the Corrosion Group of the Society of Chemical Industry last month. A party of some 20 British members, together with several ladies, was welcomed in Brussels by Professor P. Erculisse, president of the Belgian committee, and Dr. M. van Rysselberge, director of the laboratories of the *Société Financière de Transports et d'Enterprises Industrielles.*

Professor Erculisse opened the technical sessions, which were held in the lecture theatre of the historic Hotel Ravenstein. After welcoming members of the Corrosion Group, he invited its chairman, Dr. J. C. Hudson. to preside. However, Dr. Hudson, responding on behalf of the Corrosion Group, expressed his thanks for so kind a welcome, but felt it would be more suitable if Professor Erculisse continued in the chair for the meeting.

Among the Papers presented was one on the protection of buried pipes by PROFESSOR E. LECLERC (Université de Liège) and M. M. GOLDSTEIN (Usines à Tubes de la Meuse, Liège). It consisted of a review of the "Use of Petroleum Bitumens for the Protection of Buried Pipe-lines." The characteristics of a good coating were first considered as well as some of the means available for improving the properties of natural bitumens for coatings. Blown bitumens and those containing added fillers were discussed. Primary needs of such coatings are good mechanical properties, such as resistance to presure and adequate toughness, and a high resistance to water absorption and to softening by oils. Wrapping procedures utilizing textiles and the newer glass fibres were discussed, and Professor Leclerc (who presented the Paper) concluded with a comparison of recent practices in U.S.A., Great Britain, Germany and the Benelux countries.

P.O.A. Officers

Sheffield branch

The Sheffield branch of the Purchasing Officers' Association have elected the following officers and committee for 1954-55:—As *chairman,* Mr. A. E. Roberts (Newton, Chambers and Company, Limited); as *vice-chairman,* Mr. P. M. I. Turner (Staveley Iron and Chemical Company, Limited); as *hon. treasurer,* Mr. G. R. Thomas, (United Coke and Chemical Company, Limited); and as *hon. secretary,* Mr. R. Segrove (Bryan, Donkin and Company, Limited); *committee members*:—Mr. A. E. Abbey (Samuel Osborn and Company, Limited); Mr. A. L. Beard (Dunford and Elliott, Limited); Mr. J. H. Jepson (James Chesterman and Company, Limited); and Mr. W. F. S. Fisher (Newton, Chambers and Company, Limited), who will also be Press secretary.

Birmingham branch

The Birmingham branch of the Association has elected the following officers for 1954-55: As *chairman,* Mr. J. H. Townend (Alfred Hughes and Company, Limited); as *vice-chairman,* Mr. W. J. Sparkes (Accles & Pollock, Limited); as *hon. treasurer,* Mr. I. Faulkner (L. H. Newton and Company, Limited); and as *hon. secretary* Mr. P. J. McGuinness (Rover and Company, Limited).

Personal

MR. EDWARD THOMAS ELWELL, a director and general manager of John Bagnall & Sons, Limited, Lea Brook Ironworks, Wednesbury, was on July 7 installed president of the Wednesbury Rotary Club.

MR. MAX DAVIES, who joined the British Iron and Steel Research Association in 1947 and created its public relations service, leaves at the end of July to become Editor of the *Petroleum Times*.

MR. KENNETH CROXTON has been appointed a director of Geo. Robson & Company (Conveyors), Limited, elevator, conveyor and general engineers, Eclipse Engineering Works, Hodgson Street, Sheffield.

MR. P. J. C. BOVILL, an assistant managing director of Newton, Chambers & Company, Limited, Thorncliffe Works, Sheffield, and general manager of the company's chemical research, has been appointed a county magistrate in the West Riding.

MR. AND MRS. JACK GREAVES, of Chesterfield, celebrated their golden wedding last week. Mr. Greaves, who is 74, was for 53 years employed in the foundry at Markham & Company, Limited, Chesterfield, and had been foreman in the foundry for 30 years.

CONGRATULATIONS are extended to LADY OSBORN, 83-year-old widow of Sir Samuel Osborn, former head of Samuel Osborn & Company, Limited, steel and tool makers, Sheffield, who has made a good recovery from injuries sustained when knocked down by a motor car in Sheffield.

MR. C. U. MAGNUSSON has been appointed joint managing director of the Skefko Ball Bearing Company, Limited. MR. G. A. R. MEAD continues as a joint managing director of the company. MR. W. SIBERG has retired from the position of joint managing director of the company but is retaining his seat on the Board.

MR. COLIN KIRK, resident director of S.E.D.I.M., Paris, the associate company of Thos. Ward, Limited, Albion Works, Sheffield, has been appointed president of the British Chamber of Commerce in France. He is a native of Sheffield who began his career with Wards over 40 years ago. He remained in France after the first world war.

THE BRITISH ELECTRICITY AUTHORITY announces that it has appointed MR. J. C. DUCKWORTH as nuclear power engineer. His task will be to organize and lead a new branch of B.E.A.'s chief engineer's department, which will be engaged on the design, construction, and operation of nuclear power stations. Mr. Duckworth was at one time chief engineer of the Ferranti laboratories at Wythenshawe, Manchester.

MR. J. B. TAYLOR, manager of the General Electric Company, Limited's, Leicester branch, has been appointed managing director of the British General Electric Company (Canadian). MR. J. S. LANGLANDS, managing director of British General Electric (Canadian), has been appointed district assistant manager of the G.E.C. in Scotland. MR. K. L. V. NICHOLS, of the Ipswich branch, has been appointed manager of G.E.C.'s Leicester branch.

MR. F. BAKER BENNETT, A.M.I.MECH.E., has been appointed technical representative of the recently-formed non-ferrous machine-tool division of Wadkin, Limited, Leicester. Mr. Bennett was 14 years with the Holbrook Machine Tool Company, Limited, and, during the war, with the machine tool control, Ministry of Supply. Immediately prior to joining Wadkin, Limited, he was technical sales manager for the Civitas Trading Corporation, Limited.

MR. M. D. HEWITT has been appointed general sales manager of Firth-Vickers Stainless Steels, Limited, Staybrite Works, Sheffield, in succession to the late MR. J. V. HALL. He was on the staff of the former Thos. Firth & Sons, Limited, the predecessor of the present company, in the early days of the discovery of stainless steel, and took an important part in the firm's development. Since 1947 he has been a partner in John Turner & Company and in this capacity has been the Firth-Vickers representative in the north-Yorkshire area.

AFTER 49 years' service to the steel industry, MR. THOMAS GRIFFITHS, who is secretary to the Richard Thomas Steel Company of Wales Management Board and joint secretary of Richard Thomas & Baldwins, Limited, is retiring this month. Mr. Griffiths's first job in the industry was as an office boy at the South Wales Steelworks, Llanelly, then owned by Richard Thomas & Company, Limited. After the first world war Mr. Griffiths joined the headquarters staff of Richard Thomas & Company, and was appointed assistant secretary in 1920, and in 1936 took up the appointment as joint secretary, together with Mr. J. I. Roberts. When Richard Thomas & Company merged with Baldwins, Limited, in 1945, Mr. Griffiths became joint secretary of Richard Thomas & Baldwins. He was appointed secretary of the Management Board when it was established in 1952.

Obituary

MR. THOMAS MILLER SCOTT, for many years managing director of the Dorrator Iron Company, Limited, Camelon, Falkirk, has died last week at the age of 66. A native of the town, he was associated with the iron-founding industry practically all his working life. He retired about a year ago when he was succeeded by Mr. Harry Gillespie.

MR. JAMES FRANCE, who was a partner in the concern of France & Brook, ironfounders and haulage contractors, Crimble, near Huddersfield, died on July 7. He was a prominent figure in the transport world, and a former president of the Commercial Motor Users' Association, of which he served on the national council for many years. He was a member of Colne Valley Urban Council from 1947-49.

MR. FRANK VANES MADELEY, managing director of Henry Bisseker, Limited, brassfounders, of Birmingham, died on July 7 in his 70th year. Mr. Madeley, who was a member of an old Birmingham family, followed the founder of his firm, Mr. Henry Bisseker, as its managing director. He was a past-president of the National Brassfoundry Association, holding that position for three years in succession during the last war. He was also an active committee member of the British Standards Institution.

THE DEATH is announced of MR. R. L. RANKIN, who was the last surviving founder member of the Institute of British Foundrymen (formed in 1904). It was in that year that he became the sole partner of Sharp & Company (Lennox Foundry), Limited, Alexandria, Dumbartonshire, and he remained in this position until 1941, when his firm was converted into a limited liability company. He retired in 1946. Mr. Rankin was very much respected in foundry circles especially in Scotland. It was while he was on holiday at Inverness that his death occurred.

News in Brief

GUMMERS, LIMITED, valve manufacturers of Rotherham, report that they have a great demand for coppersmiths.

VOKES LIMITED, announce that their London Office is now at 123, Victoria Street, London, S.W.1, 'phone VICtoria 4550.

THE Chancellor of the Exchequer has been asked by the Association of Scientific Workers to increase substantially the salaries of university teachers and research staffs.

THE INTERNATIONAL MECHANICAL ENGINEERING CONGRESS, with permanent secretariat at 10, Avenue Hoche, Paris, 8e, is organizing the colloquium to take place at Stresa from September 24 to 25.

F. PERKINS, LIMITED, Peterborough, has secured an order from Industrija Motora, Rakovica, Belgrade, for 2,000 Diesel engines. The order is worth nearly £500,000 and was secured against world competition.

THE BELLS at St. Peter's Church, Sowerby, Yorkshire, have been re-cast at a cost of £1,450. The church dates from the sixteenth century and the bells were installed in 1781, and had previously only been quarter-turned, in 1906.

THE 9,830-TON Australian cruiser Shropshire has been sold to Thomas W. Ward, Limited. The vessel will be towed to the Forth for breaking up at the firm's Inverkeithing yard. The Shropshire was launched on the Clyde in 1928.

FORTY MEMBERS of the Nottingham Society of Engineers visited the new power station which is being erected at Castle Donington. When this £36 million power station is completed no doubt it will rank as one of the biggest in Europe.

FROM MONDAY the telephone number of the English Electric Company, Limited, and the registered office of the Marconi International Marine Communication Company, Limited, at Marconi House, Strand, London, W.C.2, was changed to COVent Garden 1234.

IT IS UNDERSTOOD that an association to deal—*inter alia*—with shell moulding has been formed in South Africa. The name of the body is South Africa Resin Binder Investigation Association and its affairs are being handled by Mr. G. F. Alexander, P.O. Box 131, Roo de Poort, Transvaal.

A NEW SERVICE AND SPARES DEPOT for British Polar Engines, Limited, has recently been opened in London on a Thames-side frontage adjacent to the Regent's Canal dock entrance. An average of 70 vessels (including river craft) with British Polar installations use the river Thames every day.

AIR CONTROL INSTALLATIONS, LIMITED, Ruislip, Middx, are opening a branch office in the Newcastle-on-Tyne area, and have appointed Mr. N. J. Shergold as branch manager. Enquiries should for the present be addressed to him at 76, Holywell Avenue, Whitley Bay, Northumberland (Tel.: Whitley Bay 23046).

DURING MAY, coastwise and foreign imports into the Tees totalled 426,433 tons, an increase of 62,000 tons over May last year. The increases were chiefly in iron ore, coal, and scrap. Exports during the month totalled 142,884 tons, an increase of 12,772 tons, due largely to higher shipments of coal and manufactured steel.

EIGHTY MEMBERS of the staff of Davy and United Engineering Company, Limited, Sheffield, travelled by coach on the night of July 9 to South Wales. During a visit to the Abbey steelworks there on Saturday, July 10, they saw in action the 80-in., three-stand tandem cold strip mill which had been made at their Sheffield works.

SEYMOURS' CASTWELL FOUNDRY, LIMITED, Litchurch Lane, Derby, state that the construction of their new works at Raynesway, Derby has been started, and they hope that the foundry will be in production by the end of this year and the patternshop next Spring. The total floor area of the works now planned, is 6,750 sq. ft. and provision is made for future extension.

GEORGE KENT, LIMITED and Foxboro-Yoxall, Limited announce that they have made arrangements for mutual marketing of the Foxboro d/p cell and the Kent oxygen analyser in the United Kingdom. Foxboro selling of the Kent oxygen analyser may later be extended to the United States. The d/p cell is used for the measurement and transmission of differential pressure values for flow fluids.

THE Yorkshire Engine Company, Limited, Sheffield, were sued at Leeds Assizes on July 13 by Mr. John William Halford, of Sheffield, in connection with the loss of his eye. He was working as a planer when a piece of flying metal struck him in the eye. As a result of the injury, the eye had to be removed. He was awarded £1,125 damages and costs in an agreed settlement.

THE DAVID BROWN GROUP have held their annual gala day at the Memorial Ground, Penistone, near Huddersfield, when 3,000 people attended, including parties from the Salford and Leeds works. Last year, the foundry group at Penistone won both the David Brown Cup and the directors' Cup, when the gala was held at Manchester. This year they failed to retain them, both being secured by tractor groups.

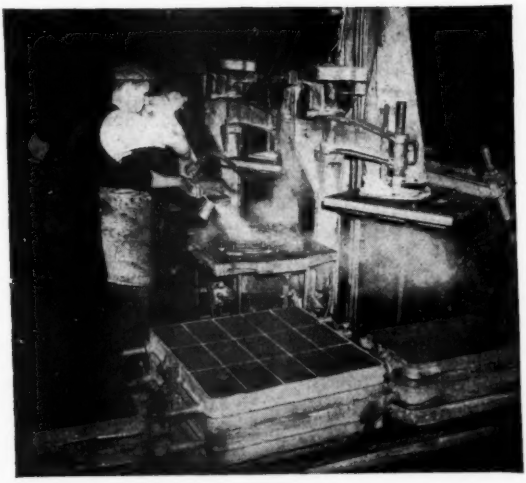
A JOINT STATEMENT issued by the Standard Motor Company, Limited, and the Rover Company, Limited, last week said that the present moment was unsuitable to carry into effect the proposed financial merger of the two concerns, but the possibility of such an operation would not be lost sight of. Meantime, the possibility of co-operation between the two companies was being actively investigated.

AFTER A FIVE DAYS' TRIAL at Stafford Assizes on a charge of conspiring with a weigh clerk to cheat and defraud F. H. Lloyd & Company, Limited, by falsely pretending that quantities of scrap steel they delivered as sub-contractors was in excess of the actual amounts, a family of five—mother, father and three sons—who ran a scrap-metal business, were imprisoned for terms ranging from 12 months to two years.

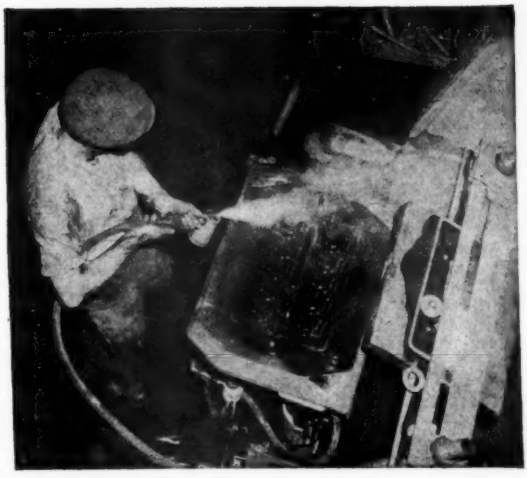
AN INTERNATIONAL CONFERENCE on electron microscopy is being held in London from July 15 to 21, at the invitation of the electron-microscopy group of the Institute of Physics. In association with this conference an exhibition has been organized of both commercial apparatus and micrographs at the London School of Hygiene and Tropical Medicine, opened by the Parliamentary Secretary to the Board of Trade, Mr. Bevins.

AS A BREAK from their usual labours, a party of 22 Northern Aluminium Company's apprentices, accompanied by the personnel manager, Mr. J. D. Elston, and assistant foundry superintendent, Mr. H. C. Lowe, visited the Jubilee Pit, West Bromwich, on Monday last week. Mr. Stanley Adams, a colliery official, conducted the party first over the surface workings and

(*Continued on page* 108)



Illustrations of "PLP" in use by courtesy of Messrs. Henry Wallwork & Co. Ltd., Red Bank, Manchester.



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News in Brief

(*Continued from page* 106)

then underground, after which the boys had a shower-bath and refreshments.

YOUTHS from public and grammar schools completed on July 16 an introductory course arranged by Joseph Lucas, Limited, Birmingham. The party, consisting of 17 boys, was housed at the residential training centre of the Lucas organization, formerly the home of the late Mr. Harry Lucas. During their week's course the youths studied mass-production methods and were shown the careers in industry available for young men.

After over 60 years with Ruston & Hornsby, Limited, the Lincoln engineers, and after having been on the Board of directors since 1937, MR. WALTER HAYNES has retired. He started work as a boy in 1892 at the works of Richard Hornsby & Son, Grantham, and after holding various positions he was appointed secretary of Ruston & Hornsby, Limited, on its formation 36 years ago. On becoming a director in 1937, Mr. Haynes continued as secretary until 1944. To mark his completion of 60 years' service in 1952, his fellow directors gave a dinner in his honour at Claridges Hotel, London.

MILLSPAUGH, LIMITED, founders and engineers, Alsing Road, Sheffield, have just completed the making table of a paper-making machine for a Canadian firm with a factory near Montreal. It is part of an £89,350 export order which was secured in the face of competition, mainly from America. Suction rolls have already been completed and sent, and other subsidiary parts will be made in Sheffield. The contract was secured largely because of a quick delivery promise and the firm has made the machine to special design in a year. It is capable of turning out paper in 92-in. wide sheets at the rate of 2,000 a minute, and also makes crêpe paper.

MIDLAND SECTION MEMBERS of the Institute of Vitreous Enamellers propose to arrange, if their is sufficient support, a trip by motor coach to Blackpool for the illuminations on Saturday, September 18, staying at the Norbreck Hydro Hotel in Blackpool and returning on Sunday. The charge, including coach fare Birmingham/Blackpool, and return, luncheon, dinner and accomodation, and breakfast and luncheon on Sunday, will be £4 0s. 0d. per person (for children sharing accommodation reduced rates apply). Interested members should communicate with the secretary, Mr. D. Sleath, Borax Consolidated, Limited, 87-89, Edmund Street, Birmingham 3.

SIR HAROLD WEST, managing director of Newton, Chambers and Company, Limited, Sheffield, presided at the distribution of prizes and certificates to apprentices and trainees at the Thorncliffe works business training college. The awards were distributed by Major-General T. N. F. Wilson, secretary of the King George Jubilee Trust. The Lord Mayor of Sheffield, Alderman J. H. Bingham, and the Master Cutler, Mr. R. L. Walsh, also attended. Recently Sir Harold opened a new billiards room at Chapeltown Working Men's Club as part of the club's extension programme. The club has a membership of 1,300. Sir Harold presented a new billiards cue to each of two members who gave an exhibition game at the opening.

MR. ALBERT HODGKINSON, 58-year-old slinger, of Sheffield, sued William Jessop & Sons, Limited, steel manufacturers, of Brightside Works, Attercliffe, Sheffield, at Leeds Assizes for injuries received at the works on April 20, 1952. Mr. G. Raymond Hinchcliffe, Q.C., said liability was admitted and the matter came before the Judge on the question of damages. Hodgkinson was walking through the melting department of the steelworks when a large board fell from an overhead crane on his head and shoulders. There was a grave injury to his brain and within a short time his right arm was paralysed from the shoulder to the tips of the finger. Mr. Justice Parker awarded £5,500 damages and £687 special damages.

MR. WILLIAM HENRY HALLAM, 37-year-old control operator, of Sheffield, was awarded £10,000 damages and £680 special damages with costs against his employers, Thomas Firth & John Brown, Limited, steel manufacturers, Atlas Works, Sheffield, at the West Riding Assizes at Leeds on July 14. It was claimed that an accident which resulted in his injuries was due to the firm's negligence in failing to fence securely rolling machinery on which plaintiff was engaged in steel rolling mills. The man had to turn over a steel slab which had to pass through power-driven rollers, a job done by means of a bar. At the time of the accident, the bar was caught in the unfenced hole at the end of the rollers and violently twisted, striking the workman.

Correspondence

[From a member of the British Foundrymen's Association]

SIR,—In perusing a recent copy of the FOUNDRY TRADE JOURNAL, I was delighted to note you had published a short history of what I knew as the British Foundrymen's Association. I was one of the early members of the Association and attended the first conference at Manchester. I still retain my membership card signed by the late Mr. Finch, the original secretary.

As a practical moulder, I was employed for some time in the foundry where Mr. Finch was manager. I was also employed for some time in the foundry of Belliss and Morcom, Birmingham, where Mr. Cook was foundryman. I left England in 1908 and after spending a year in Sydney, took charge of Thompsons' foundry, Castlemaine, where I put in nine years. During my stay with Thompsons I travelled to Great Britain in 1915 and during that tour visited many foundries in England and Scotland.

At the end of the 1914 war, I left Thompsons to take charge of the Eveleigh Foundry, N.S.W. Railway Department, where I stayed for 15 years.

I am now on the retired list and propose visiting Great Britain next year, probably May and June. I shall esteem it a favour if you will forward me a copy of the History or retain one until I call on you, which I shall be delighted to do.—Yours, etc.,

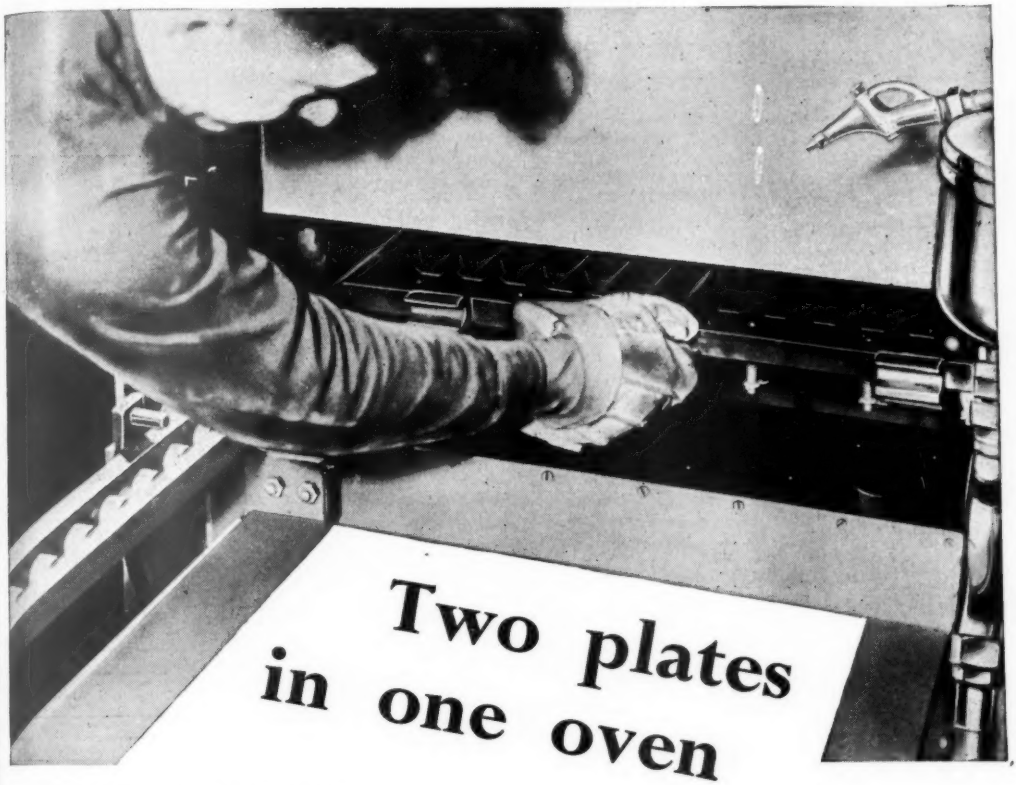
T. HUNT.

Sydney, N.S.W.,
Australia.
June 17, 1954.

[A copy of the I.B.F. history, "The First Half-century" has been despatched to Mr. Hunt, with congratulations.]

Annual Holidays

CONSTRUCTIONAL ENGINEERING COMPANY, LIMITED, THE ADAPTABLE MOULDING MACHINE COMPANY, E. TALLIS AND SONS, LIMITED.—The works of these associated companies will be closed from to-morrow evening to the morning of August 9. During this period no goods will be despatched and no delivery of goods will be accepted; but the offices will be open to deal with correspondence and telephone calls.



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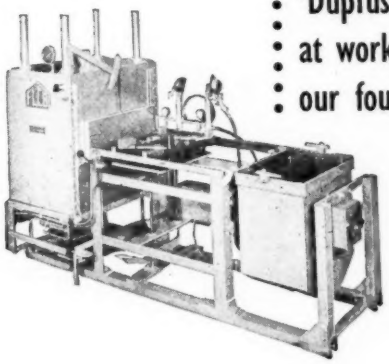
OUTPUT: 50/60 moulds per hour. *DELIVERY:* 8/10 weeks. *PRICE:* £575.

May we show you the Shelmolda 'Duplus' at work in our foundry?



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Pig-iron and Steel Production

Statistical Summary of May Returns

The following particulars of pig-iron and steel produced in Great Britain are from statistics issued by the British Iron and Steel Federation. Table I summarizes activities during the past six months. Table II gives production of steel ingots and castings in May, and Table III, deliveries of finished steel in April, 1954. Table IV gives the production of pig-iron and ferro-alloys in May, 1954, and furnaces in blast. (All figures weekly averages in thousands of tons.)

TABLE I.—*Iron and Steel Price Index and General Summary of Pig-iron and Steel Production*

Period.	Price index, 1938 = 100.			Iron-ore output.	Imptd. ore used.	Coke to blast-furnaces.	Pig-iron, ferro-alloys prod.	Scrap used in steel prod.	Steel (incl. alloy).			
	I. & S.	Coal.	All comdts.						Imports.[1]	Prod. ingots, castings.	Delivrs. finished steel.	Stocks.[1]
1952[2] ..	254	329	323	306	190	228	202	171	29	310	252	683
1953	260	350	323	304	207	237	215	188	18	339	262	962
1953—Dec.[4] ..	260	359	321	297	229	244	225	192	12	339	255	962
1954—Jan. ..	295	358	321	307	234	246	230	203	10	360	277	941
Feb. ..	259	359	322	302	230	240	222	201	14	357	290	902
March	260	360	324	322	232	238	231	203	16	365	291	898
April ..	260	360	325	312	236	243	232	200	4	368	272	945
May ..	261	367	326	306	236	240	231	208	4	375	—	927

TABLE II.—*Production of Steel Ingots and Castings*

District.	Open-hearth.		Bessemer.	Electric.	All other.	Total.		Total ingots and castings.
	Acid.	Basic.				Ingots.	Castings.	
Derby, Leics., Notts., Northants and Essex ..	—	3.5	12.2(basic)	1.8	0.2	16.7	1.0	17.7
Lancs. (excl. N.W. Coast), Denbigh, Flints. and Cheshire	0.9	29.1	—	1.9	0.4	31.1	1.2	32.3
Yorkshire (excl. N.E. Coast and Sheffield) ..								
Lincolnshire	—	38.6	—	—	0.1	38.5	0.2	38.7
North-East Coast	1.9	71.5	—	1.3	0.5	73.3	1.9	75.2
Scotland	3·8	39.1	—	1.2	0.6	42.9	1.8	44.7
Staffs., Shrops., Worcs. and Warwick ..	—	16.8	—	1.3	0.8	16.9	2.0	18.9
S. Wales and Monmouthshire	4.7	76.0	6.5(basic)	1.2	0.1	87.8	0.7	88.5
Sheffield (incl. small quantity in Manchester) ..	8.7	31.4	—	9.9	0.6	48.5	2.1	50.6
North-West Coast	0.1	1.5	5.7 (acid)	0.5	0.1	7.8	0.1	7.9
Total	20.1	307.5	24.4	19.1	3.4	363.5	11.0	374.5
April, 1954	18.6	306.9	22.7	16.9	3.2	358.5	9.8	368.3
May, 1953	24.5	283.0	21.6	17.9	3.7	339.6	11.1	350.7

TABLE III.—*Production of New Non-alloy and Alloy Finished Steel.*

Product	1952.[3]	1953.	1953.	1954.	
			Apr.	March.	Apr.
Non-alloy steel:					
Ingots, blooms, billets and slabs[5]	4.5	4.7	5.4	5.3	5.8
Heavy Rails ..	8.0	8.7	8.8	10.7	10.1
Sleepers, etc. ..	1.8	2.2	2.2	3.0	1.7
Plates, 3 mm. thick and over ..	41.4	46.5	46.3	49.7	47.0
Other rolled prod.	39.0	43.9	44.6	48.5	47.1
Wire rods and other rods and bars in coil	15.9	15.6	16.1	18.3	18.6
Light rolled prod...	46.0	49.3	54.4	45.8	44.3
Bright steel bars ..	6.5	6.7	7.3	6.3	5.8
Hot rolled strip ..	18.8	18.8	18.8	23.1	20.9
Cold rolled strip ..	6.1	5.2	4.9	6.9	6.3
Sheets, incl. coated	31.7	34.1	32.9	40.6	37.8
Tinplate, terneplate and blackplate ..	16.0	14.9	15.5	18.6	16.3
Steel tubes, pipes	20.1	20.1	20.7	20.5	20.1
Tube, pipe ftgs.	0.4	0.3	0.4	0.4	0.4
Tyres, wheels, axles	3.5	4.4	4.0	4.8	4.6
Forgings (excluding drop forgings) ..	2.8	3.1	3.4	2.8	2.7
Steel castings ..	4.2	4.0	4.2	4.1	4.1
Tool and magnet steel	0.3	0.3	0.3	0.3	0.3
Total	267.0	282.8	290.2	309.7	293.9
Alloy Steel	13.4	13.7	15.0	13.1	12.8
Total deliveries from U.K. prod.[6] ..	280.4	296.5	305.2	322.8	306.7
Add: Imported finished steel ..	12.9	6.8	8.1	8.0	4.1
	293.3	3 .3	313.3	330.8	310.8
Deduct: Intra-industry conversion[7] ..	42 7	42.6	43.9	41.5	40.1
Total deliveries of new material ..	250.6	260.7	269.4	289.3	270.7

TABLE IV.—*Production of Pig-iron and Ferro-alloys*

District.	Furnaces in blast.	Hematite.	Basic.	Foundry.	Forge.	Ferro-alloys.	Total.
Derby, Leics., Notts., Northants and Essex	26	—	18.6	25.0	0.8	—	44.4
Lancs. (excl. N.W. Coast), Denbigh, Flints. and Cheshire ..	8	—	15.5	—	—	1.6	17.1
Yorkshire (incl. Sheffield, excl. N.E. Coast) ..							
Lincolnshire ..	10	—	31.6	—	—	—	31.6
North-East Coast	24	5.1	50.1	—	—	1.4	56.6
Scotland	9	0.7	15.3	1.9	—	—	17.9
Staffs., Shrops., Worcs., and Warwick ..	9	—	*6.3	1.9	—	—	8.2
S. Wales and Monmouthshire	9	4.9	32.6	—	—	—	37.5
North-West Coast	7	16.9	—	0.1	—	1.1	18.1
Total ..	102	27.6	170.0	28.9	0.8	4.1	231.4
April, 1954 ..	105	26.8	171.1	29.2	1.2	3.7	232.1
May, 1953 ..	101	25.5	157.3	28.3	0.9	2.7	214.7

[1] Weekly average of calendar month.
[2] Stocks mainly ingots and semi-finished at the end of the years and months shown.
[3] Average 53 weeks ended January 1953, all tables.
[4] Five weeks, all tables.
[5] Other than for conversion into any other form of finished steel listed
[6] Includes finished steel produced in the U.K. from imported ingots and semi-finished steel.
[7] Material for conversion into other products also listed in this table.

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Raw Material Markets

Iron and Steel

From the blast furnaces in operation, the biggest attainable outputs are being secured, and the closer attention now paid to the preparation of ore for furnace use is yielding excellent results. But the aggregate supply of pig-iron has not overtaken requirements and imports will still be necessary until the number of operative blast furnaces is increased. Two new blast furnaces are nearing completion. Construction of others has begun or will shortly begin. But at the moment the supply of basic iron is barely sufficient and hematite and low- and medium-phosphorus irons are somewhat scarce. On the other hand, the light-castings trade is still rather dull and foundry and forge iron is obtainable at the fixed maximum prices without much difficulty.

The improvement in the demand for small bars, light sections, wire rods, and ferro-concrete bars has been well maintained, but the increased call for semis has not placed any undue strain on the capacity of the steel plants. Adequate turnovers of billets, blooms, etc., are forthcoming from home sources and the outlets for imported material have been reduced to a bare minimum. The boom in the sheet trade has given a big impetus to the call for sheet bars and slabs which promises to continue to the end of the year. Demand for heavy steel products is well maintained.

Non-ferrous Metals

Commodities continue to show strength and there is a good deal of optimism about the outlook for the coming months. Employment is at a high rate, and with the improving American situation it would hardly seem that there need be much apprehension of a serious drop in metal values. Last week saw minor fluctuations, but the tendency was on the whole steady; in spite of the approaching holiday season, prospects appear to be favourable for a continuation of the present market movement.

Zinc, it is true, was a little off on some days, but the American position has improved to the extent of an increase of 10,400 short tons in the June deliveries, the figure of 72,257 tons being the best since June last year. Stocks of zinc in producers' hands, which last month increased rather disastrously, fell nearly 9,000 tons to 201,055 tons during the month. Smelter production showed little change at 71,466 tons. Buying in the United Kingdom is on a moderate scale, but it is still difficult to persuade consumers to take a forward view. Nevertheless, business in rolled brass semis keeps up well.

Copper showed little change last week and continues to present a strong front, due largely to the firmness of the U.S. market. Custom smelters are reported to be buying scrap freely and it must be presumed that they are selling against this intake. Fortunately, the overseas demand for scrap has eased off somewhat and they are therefore able to do better now than for some time. The Chilean copper situation is still somewhat obscure, but the mines are thought to have made some good sales in the U.K. and on the Continent, so that it is hardly surprising to learn that activity is being speeded up and output increased by the working of a longer week. On the London market last week, copper closed 10s. lower for cash and 2s. 6d. down forward. Zinc lost 10s. and 15s., while lead was practically unchanged. Tin gained £11 for both positions. The Metal Exchange standard copper contract is to be changed at a date not yet specified to an in-warehouse warrant basis.

Official metal prices were as follow:—

COPPER, Standard—*Cash:* July 15, £239 10s. to £239 15s.; July 16, £239 10s. to £240; July 19, £240 to £240 5s.; July 20, £239 to £239 5s.; July 21, £236 15s. to £237.

Three Months: July 15, £237 7s. 6d. to £237 10s.; July 16, £237 5s. to £237 10s.; July 19, £237 5s. to £237 7s. 6d.; July 20, £237 to £237 5s.; July 21, £235 10s. to £235 15s.

TIN, Standard—*Cash:* July 15, £762 to £764; July 16, £769 to £771; July 19, £769 to £770; July 20, £758 to £759; July 21, £752 to £753.

Three Months: July 15, £753 to £754; July 16, £759 10s. to £760; July 19, £759 to £760; July 20, £751 to £752; July 21, £746 to £747.

ZINC—*July:* July 15, £78 to £78 5s.; July 16, £77 15s. to £78; July 19, £77 15s. to £78; July 20, £77 10s. to £77 15s.; July 21, £77 5s. to £77 10s.

First half October: July 15, £78 5s. to £78 15s. *Second half October:* July 16, £78 5s. to £78 10s.; July 19, £78 to £78 5s.; July 20, £77 15s. to £78; July 21, £77 10s. to £77 12s. 6d.

LEAD—*First half July:* July 15, £96 10s. to £96 15s. *Second half July:* July 16, £96 10s. to £96 15s.; July 19, £96 5s. to £96 15s.; July 20, £95 15s. to £96 5s.; July 21, £95 5s. to £95 10s.

First half October: July 15, £94 10s. to £94 15s. *Second half October:* July 16, £94 15s. to £95; July 19, £94 15s. to £95; July 20, £94 to £94 10s.; July 21, £93 15s. to £93 17s. 6d.

Pattern of International Trade

The year 1953 witnessed a significant change in the pattern of international trade, says the second annual report of the General Agreement on Tariffs and Trade (G.A.T.T.). The extraordinary price structure which had distorted the flow of commodities since the outbreak of war in Korea in the middle of 1950 gradually reverted to the pre-Korean situation. "While international trade has remained at a high level," the report states, "important shifts in the flow of goods between the industrial areas have brought out a pattern far better balanced than at any other time during the post-war period."

The most notable trade development in continental Europe concerned Western Germany. Whereas her share of the intra-continental trade in 1950 was 40 per cent., it became 45 per cent. in the first half of 1953. The 1937 figure was 56 per cent. The G.A.T.T. report points out that in 1953 East European trade with the rest of the world was lower than ever before. On the other hand, the trade of the mainland of China was growing.

In the House of Lords recently, Lord Mancroft, Lord-in-Waiting, announced that a meeting of Commonwealth governments is to be held later in the year to discuss the revision of the General Agreement on Tariffs and Trade.

I.B.F. List of Members

Requests are continually being made for a new list of members of the Institute of British Foundrymen. The last one, published in 1946, is now completely out of date and as it would be extremely expensive to revise and reprint, the Council has decided to make copies of a duplicated list available to members who require it at a cost of £5 5s. each. Only if sufficient members apply for copies to cover the cost of duplication will this project be proceeded with, and members interested are requested to write to the secretary as soon as possible.

BX39

Boric oxide, B_2O_3, in the form of '20 Mule Team' borax and boric acid has down the years pointed the way to success in applying vitreous enamels to cast iron and sheet steel. For vitreous enamelled signs and for the wider range of domestic articles, it enables the enamel 'glass' to fuse readily at low temperatures without warping of the metal base.

Borax is also an asset for neutralising after acid pickling; it prevents rusting and helps the ground coat to adhere. '20 Mule Team' borax plays an important part, too, in giving a bright, durable and glistening finish which is easy to clean and maintain. '20 Mule Team' borax is available as the ordinary decahydrate, as Neobor (pentahydrate) or as Dehybor (anhydrous). Our Technical Department will be glad to advise you on the best use of '20 Mule Team' products. *A 64-page handbook 'Vitreous Enamels', containing a wealth of valuable technical information, is yours for the asking.*

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Current Prices of Iron, Steel, and Non-ferrous Metals

(Delivered unless otherwise stated)

July 21, 1954

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £14 19s. 6d.; Birmingham, £14 12s. 9d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £17 5s. 9d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £17 16s. 9d.

Scotch Iron.—No. 3 foundry, £17 9s. 6d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £18 19s. 6d.; South Zone, £19 2s. 0d.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £19 19s. 6d.; South Zone, £20 2s. 0d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. of England (local iron), £17 14s. 6d.; Scotland (Scotch iron), £18 1s. 0d.; Sheffield, £18 19s. 0d.; Birmingham, £19 6s. 6d.; Wales (Welsh iron), £18 1s. 0d.

Basic Pig-iron.—£15 10s. 6d. all districts.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered)

Ferro-silicon (6-ton lots).—40/55 per cent., £42 0s. 0d., basis 45 per cent. Si, scale 17s. per unit; 70/84 per cent., £65 0s. 0d., basis 75 per cent. Si, scale 18s. per unit.

Ferro-vanadium.—50/60 per cent., 23s. 8d. to 25s. 0d. per lb. of V.

Ferro-molybdenum.—65/75 per cent., carbon-free, 10s. 0d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., carbon-free, £150 0s. 0d. to £165 0s. 0d. per ton; 38/40 per cent., £251 0s. 0d. to £270 0s. 0d. per ton.

Ferro-tungsten.—80/85 per cent., 12s. 3d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 15s. 3d. per lb. of W.

Ferro-chrome (6-ton lots).—4/6 per cent. C, £75 0s. 0d. to £80 0s. 0d., basis 60 per cent. Cr, scale 25s. 0d. per unit; over 6 per cent. C, £74 0s. 0d. to £76 0s. 0d., basis 60 per cent. Cr, scale 24s. 0d. per unit; max. 2 per cent. C, 2s. 0½d. per lb. Cr; max. 1 per cent. C, 2s. 1d. per lb. Cr; max. 0.15 per cent. C, 2s. 2d. per lb. Cr; max. 0.10 per cent. C, 2s. 2½d. per lb. Cr; max. 0.06 per cent. C, 2s. 2½d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 6s. 4½d. to 6s. 10½d. per lb.

Metallic Manganese.—93/95 per cent., carbon-free, £225 0s. 0d. to £232 0s. 0d. per ton; 96/98 per cent., £255 0s. 0d. to £262 0s. 0d. per ton.

Ferro-columbium.—60/75 per cent., Nb + Ta, 52s. 6d. to 70s. 0d. per lb., Nb + Ta.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft, u.t., £25 12s. 6d.; tested, 0.08 to 0.25 per cent. C, £26 12s. 6d.; hard (0.41 to 0.60 per cent. C), £28 0s. 0d.; silico-manganese, £33 16s. 0d.; free-cutting, £28 16s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £32 12s. 0d.; silico-manganese, £34 17s. 6d.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £29 16s. 0d.; basic, hard, over 0.41 up to 0.60 per cent. C, £30 16s. 0d.; acid, up to 0.25 per cent. C, £33 0s. 0d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £31 1s. 6d.; boiler plates (N.-E. Coast), £32 9s. 0d.; floor plates (N.-E. Coast), £32 10s. 6d.; sectional material, N.-E. Coast, £29 4s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested, £32 7s. 0d.; flats, 5 in. wide and under, £32 7s. 0d.; hoop and strip, £33 9s. 0d.; black sheets, 17/20 g., £42 1s. 0d.; galvanized corrugated sheets, 24 g., £51 8s. 6d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £53 8s. 0d.; nickel-chrome, £75 2s. 0d.; nickel-chrome-molybdenum, £84 13s. 6d.

NON-FERROUS METALS

Copper.—Cash, £236 15s. 0d. to £237 0s. 0d.; three months, £235 10s. 0d. to £235 15s. 0d.; settlement, £237 0s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 27⅞d. per lb.; wire, 268s. 9d. per cwt. basis; 20 s.w.g., 300s. 0d. per cwt.

Tin.—Cash, £752 0s. 0d. to £753 0s. 0d.; three months, £746 10s. 0d. to £747 0s. 0d.; settlement, £753 0s. 0d.

Zinc.—July, £77 5s. 0d. to £77 10s. 6d.; second half October, £77 10s. 6d. to £77 12s. 6d.

Zinc Sheets, etc.—Sheets, 15 g. and thicker, all English destinations, £108 0s. 0d.; rolled zinc (boiler plates), all English destinations, £105 15s. 0d.; zinc oxide (Red Seal), d/d buyers premises, £96 0s. 0d.

Lead (Refined Pig).—Second half July, £95 5s. 0d. to £95 10s. 0d.; second half October, £93 15s. 0d. to £93 17s. 6d.

Brass Tubes, etc.—Solid-drawn tubes, 22⅞d. per lb.; rods, drawn, 32½d.; sheets to 10 w.g., 259s. 3d. per cwt.; wire, 30½d.; rolled metal, 245s. 6d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £165; B6 (85/15), £208; BS249, £178.

Brass (High Tensile).—BS1400, HTB1 (30 tons), £200; HTB2 (38 tons), £210; HTB3 (48 tons), £220.

Gunmetal.—RCH, 3/4 per cent. tin, — ; BS1400, LG2 (85/5/5/5), £200; LG3 (86/7/5/2), £207; G1 (88/10/2/¼), £280; (88/10/2/1), £270.

Phosphor Bronze.—BS1400, PB1 (AID released), £287 per ton.

Phosphor Bronze Strip, etc.—Strip, 366s. 0d. per cwt.; sheets to 10 w.g., 388s. 6d. per cwt.; wire, 45½d. per lb.; rods, 39¾d.; tubes, 38d.; chill cast bars: solids 40½d., cored 41½d. (CHARLES CLIFFORD, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 3s. 1¾d. per lb.; round wire, 10g., in coils (10 per cent.), 3s. 7d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 3s. 6d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 3d. per lb. Antimony, English, 99 per cent., £210 0s. 0d. Quicksilver, ex warehouse, £100 0s. 0d. Nickel, £483 0s. 0d. Aluminium, ingots, £156 0s. 0d.; aluminium bronze (BS1400), AB1, £250; AB2, £259. Solder, brazing, BS1845, 1s. 11d. lb.; granulated, 2s. 2d. lb.

Recent Wills

SMITH, A. E., former Birmingham manufacturer of white metal alloys	£104,681
BOSMAN, A. R. F., formerly a director of the Morgan Crucible Company, Limited	£246,003
CLARK, E. G., secretary of the Institution of Civil Engineers	£34,302
HIRST, ARTHUR, retired cutlery manufacturer, of Bridlington (Yorks)	£14,451
CREESE, H. J., chairman of H. J. Creese & Sons, Limited, ironfounders, of Leicester	£13,081
HUNTLEY, J. G. H., deputy head of the research division of the Metal Box Company, Limited ...	£17,037
WHITEHOUSE, J. W., a co-founder and director of Metal Products Company (Willenhall), Limited, and of Willenhall Metal Reclamation Company, Limited	£94,153
WOLFF, LT.-COL. MARK ARTHUR, chairman of the Chesterfield Tube Company, Limited, and subsidiary companies, and an underwriting member of Lloyd's	£101,906
DUNLEAVY, FRANK, foundry manager of Harrison & Company (Lincoln), malleable-iron founders, who was formerly at the works of Leyland Motors, Limited, at Bolton, and was a past-president of the Lincoln and East Midland branches of the Institute of British Foundrymen	£5,351
LEEK, A. E., formerly general manager of the Distington Engineering Company, Limited, Workington (Cumberland), who was at one time chief engineer of the Wigan Coal & Iron Company, Limited, and had also held a similar position with the Workington Iron & Steel Company (branch of the United Steel Companies, Limited)...	£37,602

RUSTON & HORNSBY, LIMITED, engineers, etc., of Lincoln—Total despatches of the group in the year to March 31 show a slight decline on the previous year. The chairman, Mr. W. J. Ruston, says that the fall itself would have affected earnings very little, but there has been a rapid and general increase in costs. Trading profits, at £2,006,021, were down by £322,918, while the net profit, at £1,062,703, was £63,819 lower.

B.W.S. Master Patternmakers' Association

At a general meeting of the Birmingham, Wolverhampton, Stafford Master Patternmakers' Association held at the Red Cow Hotel, Smethwick, on June 30, a very full discussion ensued as to the co-operation between the B.W.S. and the newly-formed National Society of Master Patternmakers, and members were loud in their expressions as to the necessity for full co-operation with the National Society. Finally, the following resolution was proposed and accepted:—

> "That the B.W.S. Master Patternmakers' Association carries on in its present form until the end of the current year, *i.e.*, September 30, 1954, and after that date members of this Association continue as non-paying members of the B.W.S. if they are members of the National Society, the position to be reviewed in twelve months' time."

The members were wholeheartedly in support of the National Society and looked forward to its future working with marked enthusiasm. It is interesting to note that only one B.W.S. member-firm present at this very enjoyable luncheon meeting, was not already a member of the National Society of Master Patternmakers, and that company's representative was very confident that this would soon be remedied.

The chairman of the B.W.S. Master Patternmakers' Association, Mr. L. Brown, stated that it was very gratifying to note the enthusiasm of the members, and that it was most encouraging to him in his position as vice-president of the National Society.

At a Council meeting of the National Society, the resolution from Birmingham was widely acclaimed and that body was very pleased to welcome the B.W.S. as their first formed section.

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NOTICE

Replies to Box Numbers to be addressed to "Foundry Trade Journal," 49, Wellington Street, London, W.C.2.

SITUATIONS WANTED

YOUNG FOUNDRY MANAGER (33), well educated, keen and energetic, technically trained by well-known firm, City and Guilds, A.I.D. radiologist, successful practical experience starting prosperous grey iron and non-ferrous jobbing foundry, floor, plate, machine moulding, estimating, costing, buying, customer liaison, etc., used full control, seeks progressive situation.—Box YF652, FOUNDRY TRADE JOURNAL.

REPRESENTATION required by experienced and fully trained Foundryman, to cover the Southern half of England. Thorough practical and technical knowledge of trade. Capable of working on own account. Interested in foundry supplies, metals, ferrous and non-ferrous, Machinery, and general equipment.—Box RR610, FOUNDRY TRADE JOURNAL.

FOUNDRY MANAGER (35), A.M.I.B.F., requires similar position. Extensive experience in medium and heavy engineering castings. Also non-ferrous first-class knowledge of cupola operation and control, sand control, mechanisation. Able to control men.—Box FM640, FOUNDRY TRADE JOURNAL.

FOUNDRY MANAGER desires change. Experienced in mechanised and jobbing foundries. Buying and Sales experience, with prospect of introducing new business. Midland area. Further details on application to Box FM631, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 *inclusive or a woman aged* 18-59 *inclusive unless he or she, or the employment, is excepted from the provisions of the Notification of Vacancies Order,* 1952.

SKILLED NON-FERROUS MOULDER required. High-class light and medium sand work. Permanent post in old-established business. 5-day week.—Further details apply DANIEL YOUNG, LTD., Witney, Oxon.

METALLURGIST required for Malleable Iron Foundry (Blackheart) in the Yorkshire area. Applicant should have had experience in a similar position.—Please give full particulars of past experience and present position, which will be treated in strict confidence, to Box MR659, FOUNDRY TRADE JOURNAL.

SALES OFFICE ESTIMATOR required for Steelfoundry.—Apply in writing, giving full details of experience, etc., Box SO621, FOUNDRY TRADE JOURNAL.

PROGRESSIVE Manufacturing Company in Lancashire requires a TECHNICAL SALES REPRESENTATIVE, with a good knowledge of the application of synthetic resins in industry generally, and in the foundry trade in particular. The successful applicant should preferably be resident in the Manchester area, and own a car.—Apply in strict confidence, giving age, details of experience, salary required, etc., to Box PM623, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT—*contd.*

WORKS ENGINEER required for expanding Foundry in Glasgow area. Must be experienced in the design and layout of foundry plant, and capable of taking general control of maintenance. This is a permanent position, and will carry membership of a superannuation scheme.—Particulars of experience and present salary in confidence to Box WE645, FOUNDRY TRADE JOURNAL.

APPLICATIONS invited from fully skilled IRON AND NON-FERROUS MOULDERS for a Foundry on the South Coast. Good basic pay with pension and profit sharing schemes in operation.—Write, giving full details, to Box AI644, FOUNDRY TRADE JOURNAL.

SALES OFFICE ESTIMATOR required for Steelfoundry.—Apply in writing, giving full details of experience, etc., Box SO643, FOUNDRY TRADE JOURNAL.

METALLURGICAL CHEMIST for well equipped foundry and laboratory engaged on interesting development work, coupled with high class foundry production. Should have H.N.C. or similar and some ferrous experience. Excellent opportunity for young man to gain valuable knowledge and experience in progressive post. South-West Birmingham. State age, experience, salary, etc.—Box MC656, FOUNDRY TRADE JOURNAL.

MECHANIC required, with experience of "B.M.M." moulding machines, to service an installation of 32 Turnover and Straight draw type machines in a South African Foundry.—Replies to Box MR614, FOUNDRY TRADE JOURNAL.

METALLURGIST, to control melting, sand and annealing at Blackheart Malleable Iron Foundry in Midlands. Must be capable of producing the highest quality iron and have progressive ideas.—Apply, stating age, experience, and salary required, to Box MT653, FOUNDRY TRADE JOURNAL.

GRAVITY DIE FOUNDRY (Aluminium) in Midlands requires SHOP MANAGER. Must be practical man, capable of taking full charge of labour and production; age 30/40. Four-figure salary for the right man.—Box GD616, FOUNDRY TRADE JOURNAL.

JOBBING MOULDERS required. London shop; also CUPOLA FURNACEMAN.—Apply PLANT, MACHINERY & ACCESSORIES, LTD., 136/140, Bramley Road, W.10.

A MIDLAND Mechanised Malleable Foundry requires PRODUCTION/METHODS ENGINEER. High salary offered for the right man. Superannuation scheme in operation.—Write, stating experience and salary required, Box AM618, FOUNDRY TRADE JOURNAL.

FOUNDRY METALLURGIST required for West Midlands. Must have sound experience of High Duty Iron, and it would be advantageous to have some knowledge of Malleable Iron.—Box FR657, FOUNDRY TRADE JOURNAL.

UNIVERSAL MILLERS for Birmingham and Manchester. First-class men, used to high-class work to dead-on limits. Excellent conditions and highest possible remuneration. Particularly accustomed to handling latest and largest Huron, Cincinnati and similar universal milling machines.—Write full particulars of experience to WRIGHT & PLATT, LTD., the world's largest engineering master patternmakers, Irving Street, Birmingham, 15.

SITUATIONS VACANT—*contd.*

FOUNDRY ESTIMATOR, in South Birmingham. Experienced in weight estimation and cost extensions. Must be fast, accurate worker. Good wage offered.—Box FE636, FOUNDRY TRADE JOURNAL.

FOUNDRYMAN / METALLURGIST, with theoretical knowledge and practical experience in aluminium and copper-base alloy foundry physics. Keen man, to cover experimental and routine control work. South Birmingham area.—Box FM637, FOUNDRY TRADE JOURNAL.

FOUNDRY CHIEF INSPECTOR for Light-Alloy Gravity Die and Sand Foundry in South Birmingham. Good engineering background and working knowledge of quality control essential. Approved A.I.D. and other authorities.—Box FC638, FOUNDRY TRADE JOURNAL.

ASSISTANT PRODUCTION MANAGER required, age about 28-30. Apply in writing, stating full details of previous experience and salary required.—All applications will be treated in strict confidence, and should be addressed to GENERAL WORKS MANAGER, Bradley & Foster, Ltd., Darlaston, South Staffs.

TECHNICAL ASSISTANT.—An expanding Foundry in the North-East, producing Non-ferrous (principally Aluminium Alloy) sand, shell, and gravity die castings, has a vacancy for a Technical Assistant, with sound Foundry Drawing experience, educated to H.N.C. standard, and preferably with some foundry experience. Salary according to ability and previous experience, with excellent prospects of promotion to Foundry Manager. Housing assistance if required.—Reply, giving full details of career to date, age, etc., to:—MANAGING DIRECTOR, Daralum Castings, Ltd., Longfield Road, Darlington.

PATTERNMAKERS, experienced in both wood and metal, wanted in Birmingham and Manchester by the world's largest engineering master patternmakers. Must be accustomed to highest standards and accuracy, and prepared to work overtime. Ideal conditions, top remuneration.—Write full particulars of experience to Head Office, WRIGHT & PLATT, LTD., Irving Street, Birmingham, 15.

METHODS ENGINEER required for large Iron Foundry in North Midlands area. Applicant must have previous experience of this work, and be fully competent to work on own initiative in carrying out investigations into existing conditions and pre-planning production methods for new components. This is a highly interesting post, on monthly staff basis, with good commencing salary and excellent prospects of advancement in the development of a new Department. Good recreational facilities, superannuation scheme.—Write to PERSONNEL MANAGER, Box ME655, FOUNDRY TRADE JOURNAL.

FOUNDRY MANAGER required for Malleable Iron Foundry in Home Counties. Age 33 to 45. Salary £1,000, and pension scheme. House with garage available at nominal rent.—Apply, giving full history of education, posts held, technical and managerial experience, to Box FM609, FOUNDRY TRADE JOURNAL.

SKILLED NON-FERROUS MOULDERS required. Light and medium, dry and green sand-work. Top rates of pay and piecework. Permanent employment with an old-established firm in Yorkshire Accommodation found for single men.—Write Box 9906, C.P.P., 35, Morley Street, Bradford.